Engineering and Mining Journal

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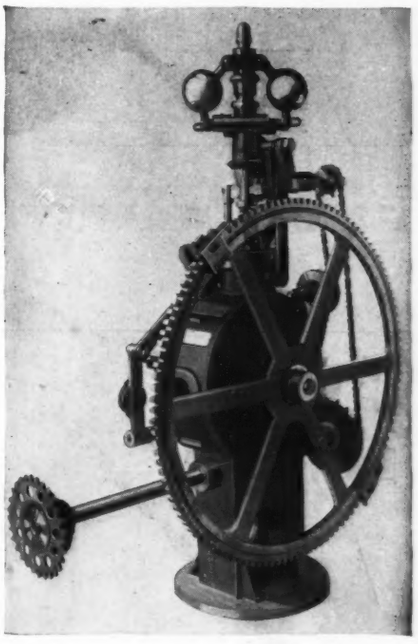

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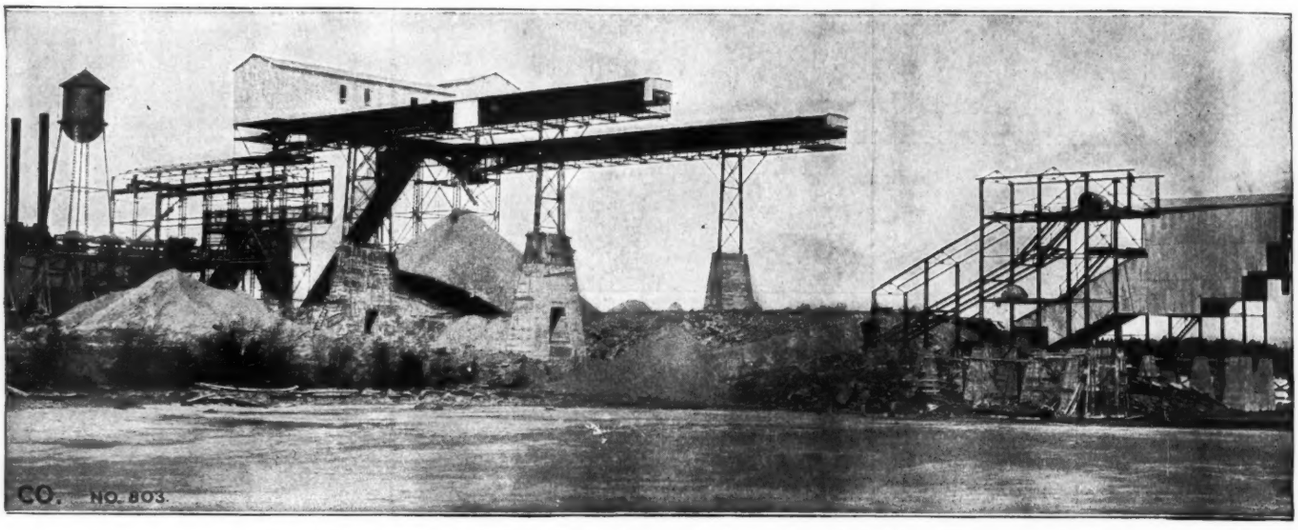

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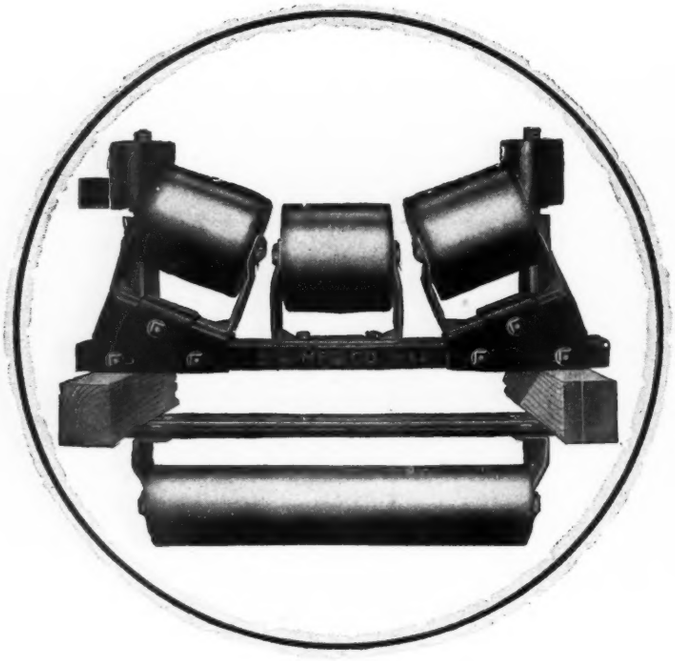

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Prospecting an Iron Ore Property

BY J. F. KELLOCK BROWN*

Difficulties experienced in district where few miners could be found and where local labor was inefficient and susperstitious. Some of the costs incurred and why; some of the delays caused and why.

THE property, containing an occurrence of magnetic iron ore, was situated in the hills 18 miles from the nearest railway station, and that on a branch line with triweekly traffic. For nine miles from the station the road was good and fairly level but the remaining nine miles was down and then a heavy climb up again; the road was a mere track through heavily timbered country with grades ranging up to 30 degrees.

The actual outcrop of the orebody itself existed in the heart of the timber land, and a road had to be cut into it for over a mile. About the only time that new road was reasonably passable was in the winter; in the summer it degenerated into a bog and had to be made into a corduroy. No houses were near enough to be of service as boarding establishments, consequently house room had to be provided at the scene of the operations. Food was readily obtainable from a small village 10 miles away, and even from stores at the station without any trouble.

When the operations began, the outcrop of the vein showed a width of 8 ft. over a distance of 300 ft. The surface soil and clay averaged about 20 ft. deep and the position of the openings where the ore was visible had been carried out with a small dip needle. The magnetic attraction of the orebody was sufficient to draw this dip needle to the vertical position. No actual outcrop of the orebody had ever been visible at the surface, and very little float ore had been found.

PLANT AND GENERAL TERRITORY IN DISTRICT PROSPECTED FOR IRON

General Geological Conditions

From what could be learned of the geology in such a heavily timbered country and where the outcrops were hidden under a very considerable depth of surface soil, it appeared that the iron occurred along or near the contact of pre-Cambrian rocks and rocks of Lower Car-

*137 McGill St., Montreal, Canada.

boniferous age. The Carboniferous stratum was not visible in any of the shafts sunk, but was in evidence in a brook some miles from the iron on the probable strike of the contact. The actual contact rock in all the holes sunk was either a granite or a white pre-Cambrian limestone. The ore and limestone graded into each other, but the granite formed one wall. Unfortunately, the limestone was not consistently on the foot wall, sometimes being absent, and sometimes crossing over to the hanging wall, and it therefore lost some of its value as a guide. The general dip was about vertical but, varying a little toward the slope of the hill, ranged down to 80 degrees.

The ore itself, as first discovered, was a hard steel-gray compact magnetite. In some of the later discoveries the color changed to a distinct blue shade and the character from a compact rock to one of a more granular appearance. Pyrite was not present to any extent and, when it did occur, appeared in lumpy aggregations easily separated. The analysis of the ore as determined by a number of tests ran about as shown in the table.

APPROXIMATE CONTENT OF ORE

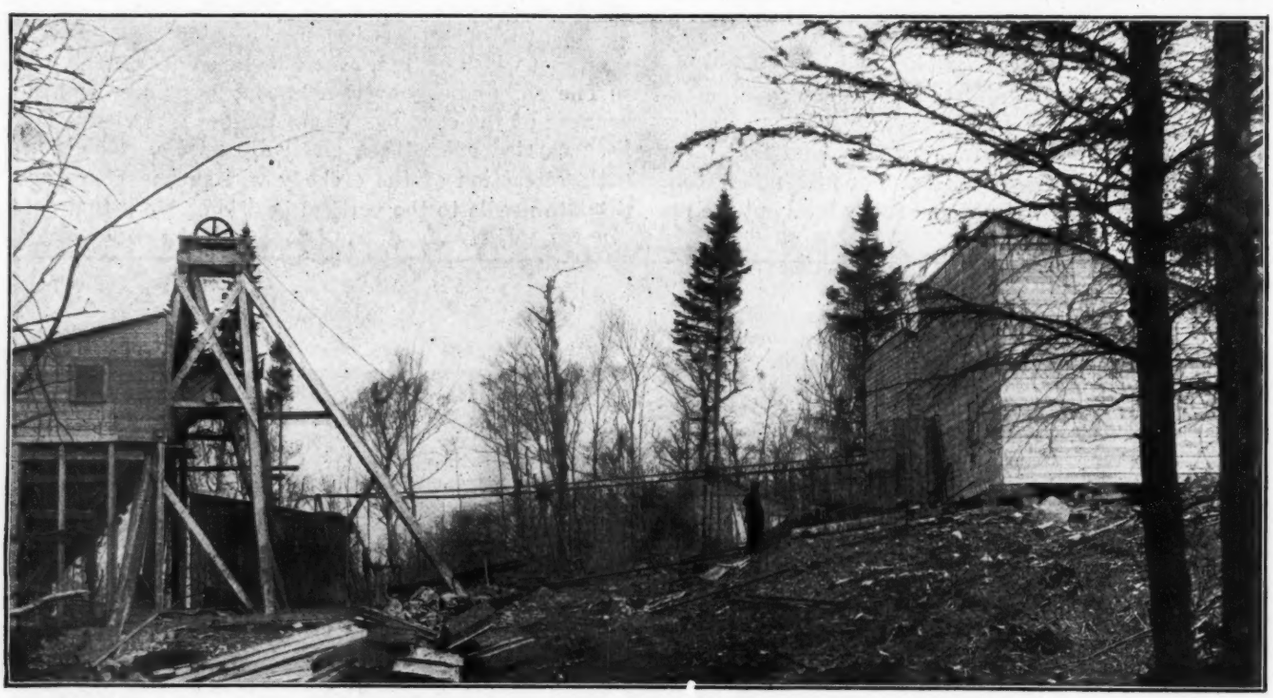
Shaft No.	Fe	SiO_2	S	Ph
1	65.90	5.12	0.080	0.005
2	63.90	5.58	0.053	0.008
3	63.77	5.64	0.060	0.011
4	64.70	3.66	.....	.....
5	65.03	5.30	.....	.....
6	65.10	5.36	.....	.....

The material was a very attractive ore and provided ample justification for the outlay upon proving its existence in quantity.

Operations began in the fall of a dull year, and labor was for that reason comparatively easy to get, despite the fact that the rate of wages, except for general labor, was high owing to the position of the property, the unattractiveness of the situation and difficulty in getting there. A number of rolling stones in the shape of old miners and prospectors appeared out of the unknown in the hope of getting a steady winter's work. One man in particular made quite a sensation on his arrival one evening with his stock in trade and belongings piled upon his head in the form of three old and battered hats which he wore all at once. The first was a winter wool cap, surmounted by a hard hat and that crowned by a summer and much-battered straw. The hard hat contained all his earthly possessions.

The wages paid throughout the work were: General labor, $1.50 per day; blacksmith, $2; carpenter, $2.50; pipe fitter, $2.20; mechanic, $3; enginemen, $2.50; boilermen, $1.75; sinkers muckers, $2.25; machinemen, $3; chief sinker, $4; shift boss, $5 per day. Board at the mine worked out at about $17 per month, per man, this being the cheapest for which it could be done.

Work was begun by hauling in as much material as possible before the roads got bad through the fall rains. This included a 60-hp. vertical boiler weighing three tons, a 38-hp. vertical boiler, an air compressor of the two-stage type and one which finally proved to be a regular glutton for steam, a two-cylinder double-drum steam hoist, smoke-stack, two Cameron sinking pumps, one horizontal boiler-feed and general-service pump, four hammer drills, one larger drill on tripod and a considerable quantity of minor material in the way of ropes, hose, pulleys and general supplies.



HEADFRAME AND SHAFTHOUSE USED IN PROSPECTING FOR IRON

For ordinary hauling purposes the rates paid per day averaged for single team and driver or without driver, $4; double team and driver, $8; double team and two men, $10; team of four horses, $14.

To take the heavier pieces—and in fact it came down to being pretty near anything as the weather got worse—the teams available in the neighborhood proved far too light weight, consequently arrangements were made with a teamster from a mining district and accustomed to work of that class. The cost of bringing in the material with his aid was for the large boiler, $94; hoist, $35; compressor, $62; 17 tons coal, $73.72; a total of $264.72.

This showed a great variation per ton mile, and an even worse variation per ton. The reasons for this, however, were readily apparent. Three days were required for taking the boiler in, while the rest of the material, being much less in weight, came in more rapidly. The cost on the coal averaged almost $4.10 per ton, and considering that it cost $3 per ton at the railway track, the price reached a relatively high figure, for those days, delivered at the mine. As it afterward turned out, that coal was extremely useful because, owing to poor labor and the rapacity of the compressor for steam, it became almost impossible to maintain the steam pressure with wood, the boilers being too small for the work.

Efficiency of Crew Below Par

The class of general labor available was very poor, all being full of superstitions and extremely ignorant. At times when the boiler might prime, the boiler house would be promptly deserted by a quaking gang of firemen, and on days when a gage-glass burst, the landscape was decorated with legs "hiking" for the woods. Quite a number of men refused to work alone at night for fear of "spooks." With this class of men constant watch is required in even the most trifling details about the place, and trouble and damage to the small plant is liable to occur any hour of the day and night. Once it was being called out of bed on a cold winter's night to explain why the hoist should refuse to hoist, nothing being the matter with it except want of oil, the cylinders having been allowed to get absolutely dry. Another time a pump refused to do its duty, and investigation disclosed the fact that one of the amateur pumpmen on the job had taken upon himself the task of replacing a gasket on the steam cylinder and in replacing the head had left a nut inside. Such occurrences are terribly exasperating on work of this nature where the time lost and the material wasted is not easily replaced, but they have to be expected and represent the price paid for inefficient labor.

Immediately on the arrival of the plant, work started on the preparation of the foundation for the various parts of the machinery; the erection of houses over them; a bin, headframe and bunkhouse. The foundations were of hardwood, and while no difficulty was experienced with the boilers or the hoist, considerable trouble developed with the compressor since it consisted of a number of separate parts. A composite foundation of timber and broken stone is difficult to level and will not in many cases stay level when the weight of the machinery begins to come on it. In this case, too, some brilliant genius provided foundation bolts that had to be used from below, requiring in turn that small shafts be sunk under each hole before this could be done. With foundations of this class, all frost has to be out of the ground, since otherwise there will be a great tendency toward unequal sinking. Timber for all this work was obtained locally. Heavy timber, black pine (so-called), cost $12 to $14 per M.; softwood, up to eight inches, $1 per tree; hardwood sticks, for the cutting; cordwood for firing, $2 per cord delivered at boilers.

Some strange conditions arose through the timber question. Contractors anxious to get work on any terms would offer timber for 50c. a cord, and then find after a few days' trial that they could make nothing at it. Others for divers unknown reasons refused to allow a tree to be cut on their ground, although this work afforded them an opportunity of acquiring some money in return. The variations in the prices for cordwood actually ran from $7 down to 50 cents.

The houses, headframe, bin and sorting house were all locally designed, cut in the adjoining woods and erected by the self-elected staff of carpenters. Being used to the erection of wooden buildings, that part of the work proceeded rapidly, but the erection of the headframe, with its long timbers, notching and bracing, required a deal of work and explanations. A self-tipping type used in the Cobalt region was built, and during the course of making it, the spectacle of the two bosses of the outfit doing the work while the gang stood round and looked on was often witnessed.

COST OF CONSTRUCTION

Headframe, 30 ft. in height, longest sticks 10x10 in. x 33 ft.		$230.19
Compressor house,	24x17 ft.	186.95
Hoisting house,	16x12 ft.	128.12
Boiler house,	18x12 ft.	87.04
Store,	12x12 ft.	74.95
Forge,	12x12 ft.	79.34
Half-buried magazine,	13x10 ft.	86.05
Bin and sorting house attached to headframe, 12x18 ft., supported on columns		180.09
Bunkhouse,	18x15 ft.	110.10
		$1,162.83

The houses erected and plant in order, arrangements were made for double-shifting the operations. The shaft was to be 8 x 10 ft. in the clear, timbered for 20 ft. down where solid rock would probably be reached. Drilling and pumping by compressed air required that the compressor run constantly. Three shifts of 8 hours each were in the shaft. The surface day shift ran 11 hours and the night 13, changing at the week ends. Work stopped at 11 o'clock on Saturdays and began at midnight Sunday. Cordwood being delivered in large pieces and the boilers being of different sizes necessitated a man working part of the time splitting down, and further, the steam demands on the boilers being great, steady attention had to be given them. In the course of the work a few differences of wages had to be made, but the table shows substantially the cost per day.

COST PER DAY OF OPERATIONS

Boilers:	
Day, 2 men @ $1.75	$3.50
Night, 2 men @ 1.75	3.50
Hoist:	
Day, 1 man @ $1.75	1.75
Night, 1 man @ $1.75	1.75
Compressor: *	
Day, 1 man @ $1.75	1.75
Night, 1 man @ 1.75	1.75
Forge:	
Day, 2 men @ $1.50 and $2.50	4.00
Deckhead:	
Day, 2 men @ $1.50	3.00
Night, 2 men @ 1.50	3.00
Shaft:†	
3 machinemen @ a $3	9.00
9 muckers @ $2.25	20.25
Overseeing:‡	
Day, 1 foreman @ $5	5.00
Night, 1 foreman @ $4	4.00
	$62.25

*The compressormen also attended to pumps and did any odd repairing work. †Three shifts 4 men each, 1 machineman and 3 muckers and helpers. ‡The nightman was chief sinker and the day man helped prepare timber.

Twenty-eight men in all were employed, 13 below and 15 above ground.

After the initial troubles were over and everybody had settled down into knowing what they were doing, after the men had learned the difference between a Stillson wrench and a globe valve, knew how to thread a pipe coupling, and had managed to maintain a steady steam pressure instead of blowing off one hour and no pressure the next—the rate of sinking kept constant at about 8 ft. in the 24 hours, so the cost per foot worked out at about $8, which shows the kind of going.

From experience on this job in particular, I am inclined to think that there are two things to be devoutedly wished for on all prospecting work, and these are a well-trained crew of men and some backing from the crowd financing the operation. It is a pleasure to work with a slick bunch of men; everything goes along smoothly and should any breakdown occur, it is attended to with the minimum of trouble. Looking back on the days and nights spent on this work, it appears a marvel that we ever progressed at all. Only four men out of the whole crew knew anything about the work; 20 had never worked near either an engine or a boiler, and 24 had never been down a shaft. At first over 20 would not work in the shaft at all, until acquaintance made them more confident. Threading and putting together a pipe line was a mystery to all. The first man who claimed he was a blacksmith produced such work that his resignation was demanded instanter, and nine self-taught handlers of the hammer and tongs were tried before a satisfactory one was found.

Poor backing from those responsible for the beginning of an enterprise is not only a stupid policy, but it is extremely mortifying to those responsible for the carrying out of the work. To have plant and supplies promised and delivery agreed to for a certain date, and then have to keep "nagging" a head office for them when weeks overdue is not conducive to speedy and steady work; and the spectacle of the whole crowd of men amusing themselves shingling a house because something has been lost on the way that has kept the work behind may be ludicrous, but it also tends to make the man in charge a perpetual grouch. Worse still is the concern that is careless about the payday. To have to lamely explain that such an important matter has been overlooked and promise that the money will come up by the next mail (and then it doesn't) creates a state of affairs under which it is impossible to hold the men worth holding on the work and tends to keep the labor constantly changing.

Risk Assumed by Mine Timberman

BY A. L. H. STREET*

An experienced mine timberman assumed the risk of being injured through fall of material from the part of a roof he was timbering, due to jarring of the earth in the near-by operation of pneumatic drills, although his "partner" had assured him that the roof was safe and the shift boss declined to stop the drills when the danger of falling rock was suggested. (Utah Supreme Court, Golesh vs. Utah Apex Min. Co., 162 Pacific Reporter, 369).

Construct 85-Ton Steel Hopper Car

A steel car of 85 tons, or 2900 cu.ft. capacity, and having five hoppers instead of four has recently been constructed by the Pennsylvania R.R. The car has a length, coupled, of 50 ft. 4 in. and an extreme width of 10 ft. 2 in., while the inside dimensions are 46 ft. 6 in. by 9 ft. 4⅞ in. The height above rail is 10 ft. 6 in., and the front wheelbase is 5 ft. 10 in. A heap capacity of 328 cu.ft. brings the total capacity to 3228 cu.ft. The light weight of the car is 60,000 pounds.

*Attorney at law, 829 Security Building, Minneapolis, Minn.

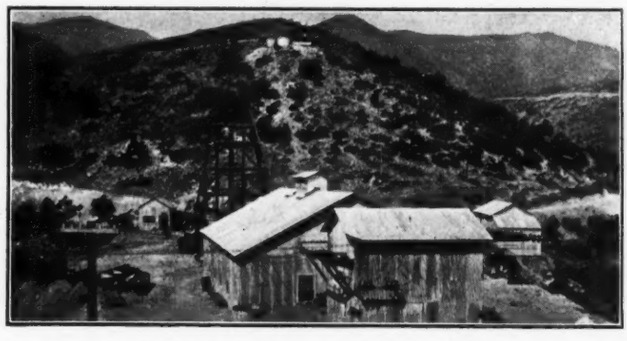
Shaft-Sinking Record at Jerome, Ariz.

Since the discovery of the United Verde Extension Mine the district about Jerome, Ariz., has received a great deal of attention from mining engineers and operators. Prospecting resolved itself first of all into a question of shaft sinking, and the development companies formed were organized on a basis permitting sinking a shaft to 1200 or 1400 ft. before crosscutting and drifting commences. Under these conditions it was natural to look for something pretty good in shaft-sinking records, and the Gadsden shaft is the first one to "draw blood."

The Gadsden is a development prospect of the Calumet & Arizona Mining Co. It is in the mineral belt about 1½ miles south and east of Jerome. The work is under the general direction of John C. Greenway, general manager of the Calumet & Arizona at Bisbee, and J. K. Hooper is the superintendent directly in charge. It was decided to open the property by a shaft to approximately the 1000-ft. level before drifts were run.

The shaft is 5 ft. x 17 ft. 10 in. in the clear, divided into two hoisting compartments and a pipe and manway; 12 x 12-in. timbers are used, and the ground is broken about 8 x 21 ft. The surface plant consists of a 220-hp. direct-motion electric hoist, an 888-cu.ft. Imperial belt-driven compressor and full blacksmithing equipment, including a No. 5 Leyner sharpener.

By May 1 the work was well under way. A satisfactory bonus rate had been worked out by Mr. Hooper, and the men were instructed to go to it. For seven consecutive days the shaft went down nine feet a day, and no part of the work was allowed to drag. The shaft was close timbered, guides, ladderway, air and water pipes kept up each day. During the month some time was lost because of power trouble and the Jerome strike tied the work up several shifts; in spite of all this a grand total of 202 ft. was made for the month—a record which is now a mark for all the properties in the district.



GADSDEN SHAFT, JEROME, ARIZ.

The Gadsden shaft during the record month was in limestone, which varied from a fairly solid uniform drilling rock to a shattered fitchery ground. The regular shaft round was used, cut holes running from 10 to 12 ft. deep. Five Ingersoll Jackhamers with ⅞-in. hollow hexagon steel were used, and no difficulty was experienced in drilling the deep holes, steels being fitted with standard four-point bits. All holes were loaded with 40% and 60% gelatin powder, the 60% being placed in the bottom of the holes.

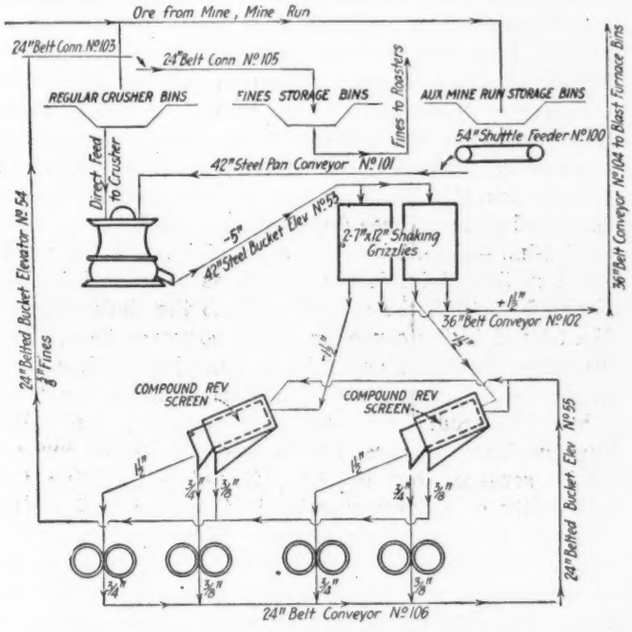
At the end of the month the shaft was in excellent condition, no detail having been slighted.

The United Verde Crushing Plant

By T. C. ROBERTS
Chief Engineer, United Verde Copper Co.

A crushing and screening plant was built by the United Verde Copper Co. at the mine to prepare the ore for shipment to the smeltery at Clarkdale, Ariz. The installation is described.

THE old smeltery of the United Verde Copper Co., at the mine at Jerome, which was abandoned on account of mine caving, was entirely a blast-furnace plant. When the new plant was erected at Clarkdale, it was decided to build four 26-ft. x 48-in. blast furnaces, and three 19 x 100-ft. reverberatory furnaces. A test of the ore appparently showed that sufficient fines would be available by screening for two reverberatory furnaces. However, it was found shortly before the reverberatories were ready to start that the character of the ore had changed and that it would be necessary to build a crushing plant. It was thought advisable to attempt to sort the waste rock from the ore to avoid hauling the former from the mine to the plant, and it was decided to place the crushing and screening plant at the mouth of the 1000-ft. tunnel, which is also at the upper end of the Verde Tunnel & Smelter R.R., over which the ore is hauled a distance of six miles to the smeltery at Clarkdale. This plant is called the Hopewell.


Ore from Mine, Mine Run
24" Belt Conn. No. 103
24" Belt Conn No. 105
REGULAR CRUSHER BINS
FINES STORAGE BINS
AUX MINE RUN STORAGE BINS
Fines to Roasters
54" Shuttle Feeder No. 100
42" Steel Pan Conveyor No. 101
Direct Feed to Crusher
42" Steel Bucket Elev. No. 53
2-7" x 12" Shaking Grizzlies
36" Belt Conveyor No. 104 to Blast Furnace Bins
36" Belt Conveyor No. 102
24" Belted Bucket Elevator No. 54
24" Belted Bucket Elev No. 55
COMPOUND REV SCREEN
COMPOUND REV SCREEN
24" Belt Conveyor No. 106

HOPEWELL CRUSHING PLANT OF THE UNITED VERDE COPPER CO.

The original installation consisted of two sets of 54 x 24-in. crushing rolls, one No. 9 gyratory crusher, one 60-in. x 18-ft. screen, with the necessary bins, elevators and conveyors. It has been decided that more reverberatories will be built in the Clarkdale plant, and additional equipment was ordered for the crushing plant at the mouth of the tunnel.

The plant has a normal capacity of 400 tons per hour of mine-run ore. There is, adjacent to the crushing plant, a system of storage bins, the tops of which are equipped with tracks over which the ore trains operate and dump into the bins. Underneath these bins the main-line trains of the Verde Tunnel & Smelter R.R. operate, into which the treated ore is loaded to be hauled thence to the smeltery for treatment.

The ore is first brought in on the mine train and dumped either into a regular crusher bin of two compartments or into the auxiliary mine-run storage bin. From the regular crusher bin and from the auxiliary mine-run bin, the ore is fed directly into a No. 9 Gates gyratory crusher, and from it a shuttle conveyor discharges upon a 42-in. steel-bucket elevator, and is elevated from the ground floor of the crusher building to the top floor and discharges upon two 7 x 12-ft. Timber Butte-type shaking grizzlies. The reject from these grizzlies, $+1\frac{1}{2}$ in., is discharged upon a 36-in. belt conveyor and delivered to the blast-furnace section of the storage bins. The undersize, $-1\frac{1}{2}$ in., is delivered to two compound revolving screens. The internal screen is 60 in. in diameter and 18 ft. long, having $\frac{3}{4}$-in. round holes. The external section of the screen is 80 in. in diameter and 15 ft. long, and has $\frac{3}{8}$-in. round holes. The first reject from the screens, namely, $-1\frac{1}{2}$-in., is discharged into two sets of 54 x 24-in., Anaconda-type crushing rolls set to $\frac{3}{4}$-in. The product of these rolls is discharged upon a 24-in. belt conveyor. The second reject from the screens, $-\frac{3}{4}$ in., is discharged into two 24 x 54-in. Anaconda-type crushing rolls set to crush to $\frac{3}{8}$-in. The discharge from these rolls is also received by the 24-in. belt conveyor. The third reject from the screens, $-\frac{3}{8}$ in., is discharged into a 24-in. belt-and-bucket elevator, is elevated to the top of the crusher building and discharged upon a 24-in. belt conveyor and delivered to the fine-storage section of the mine bins. The product from the four sets of rolls, $-\frac{3}{4}$ in. and $-\frac{3}{8}$ in., having been discharged upon a belt conveyor, is discharged into a 24-in. belt-and-bucket elevator and returned to the screens to be rescreened or recrushed, as its size requires.

A double-compartment storage bin is placed directly over the No. 9 gyratory crusher, having two air-operated gates in each compartment. The capacity of this bin is 3426 tons. Operating in conjunction with the bin a portion of the mine-storage bins are used, termed auxiliary storage bins, the capacity of which is 6800 tons of ore. Operating in connection with transferring the ore from the bins to the conveyor system, there has been installed a 54-in. shuttle-operated belt conveyor arranged to operate along a set of rails in alignment with the discharge gates of the mine bins. This shuttle is placed so as to receive ore from the gates beneath the bins and discharge it upon a 42-in. steel-pan conveyor. The shuttle conveyor is equipped with one 5-hp. 220-volt compound-wound direct-current motor for operating the bridge backward and forward to align the shuttle with any one of the given six discharge gates of the auxiliary-mine bins.

The belt-head pulley on the shuttle is a magnetic separator 58 in. in length and 18 in. in diameter, hav-

ing 16 sections and 16 poles, thus providing a strong enough magnetic field for the extraction of drills, spikes, hammers and any apparatus that might get into the ore. The pan conveyor operating to receive discharge from the shuttle is a steel conveyor 42 in. wide, with 12-in. pans on two side-link chains, equipped with 8-in. self-oiling rollers. The pans are padded on the base with 4 x 10-in. maple blocks. The speed of this conveyor is 40 ft. per min., and it is driven by a 50-hp. motor. Ore can be discharged into the No. 9 gyratory crusher by two different methods, either by direct discharge from the bins directly above, or from the auxiliary mine storage bins by the employment of the shuttle conveyor and pan conveyor. The maximum size of any piece of ore coming from the mine is approximately 18 in., while the average size is about 8 inches.

The No. 9 gyratory crusher is set to crush this material to —4¾ in. This makes a product 70% under 1½ in. The No. 9 gyratory crusher is operated by a 150-hp. slip-ring type motor and has a capacity at this size of crushing of 400 to 450 tons per hour. The No. 9 gyratory crusher discharges into a 42-in. bucket elevator and is elevated 68 ft. to the top of the building, where ore is discharged into a chute and is equally distributed upon two grizzlies.

The crusher elevator is of steel throughout; it has a speed of 45 ft. per min. and is driven by a 75-hp., slip-ring type motor. The pockets are held in alignment by steel-link chain, operating on 8-in. self-oiling rollers.

The floors of the main building are divided and named as follows: First or ground floor is called the drive floor; second floor is called the rolls floor; third floor is called the crusher floor; fourth floor is the screen floor, and the fifth floor is the conveyor floor, all of which is shown in Fig. 6.

The crusher elevator discharges sufficiently above the conveyor floor to distribute equally its ore upon two 7 x 12-ft. shaking, Timber Butte-type grizzlies. These grizzlies are set on a slope of 11½ deg. and reciprocate on 1⅝-in. eccentric, with 110 revolutions of shaft or 220 strokes per minute. Each grizzly has a capacity of 400 tons per hour. They are driven by a 75-hp., slip-ring type motor. The oversize from the grizzlies, being above 1½-in. and up to 4¾-in., is discharged upon a 36-in. belt conveyor, operating at a speed of 300 ft. per min. and driven by a 25-hp. induction motor. This 36-in. belt conveyor is discharged into a similar 36-in. conveyor, running in parallel with the storage bins and has operating in conjunction therewith a traveling distributor, for the purpose of distributing the ore on this conveyor to any one of the several bins that may be selected. This conveyor is driven by a 440-volt, 15-hp. motor. The undersize from the grizzlies is discharged into two revolving screens.

Compound Revolving Screen

The internal screen is 60 in. in diameter and 18 ft. long, made up in four sections, each of four segments of manganese-steel screens with ¾-in. round holes. The external section is 80 in. in diameter and 15 ft. long, with three sections of four segments each, and has ⅜-in. round holes. The product through the ⅜-in. round holes from the external section of the screen is discharged into a chute beneath and into a fines elevator having 24-in. buckets on a 26-in. belt, operating at a speed of 250 ft. per min. and discharging the fines upon a 24-in. belt conveyor on the conveyor floor. This conveyor has a normal capacity of 200 tons per hour and a possible overload of 150% and operates at a speed of 300 ft. per min. This conveyor, in turn, discharges its fines upon a 24-in. belt conveyor, No. 105, running in parallel with the storage bins and over the top, with a distributor arranged in order that the fines upon this belt may be placed in any one of the several bins selected. The second reject, —¾-in. and +⅜-in., is discharged into two sets of 54 x 24-in. Anaconda-type crushing rolls, having a peripheral speed of 1040 ft. per min. and driven by a 150-hp. motor. The rolls are set to crush to ⅜-in. or less, and discharge upon a 24-in. belt conveyor, which elevates the product to the screens by way of the same inlet that takes product from the grizzlies. The third reject from the screens, —1½-in. and +¾-in., is discharged into a second pair of 54 x 24-in. Anaconda-type crushing rolls, having a peripheral speed of 1040 ft. per min. and set to crush to ¾-in. or less. These rolls are also driven by a 150-hp. motor. The discharge from these rolls is to the same 24-in. belt conveyor that receives the discharge from the first set of rolls, and is also discharged into the bucket elevator and is elevated and discharged into the screens through the same inlet with the product of the other rolls and the grizzlies. This elevator is driven by a 35-hp. induction motor, and the 24-in. belt conveyor is driven by a 15-hp. motor. It will be seen, therefore, that the product 1½-in. and less, passing through the grizzlies is discharged into two revolving screens, and that these screens are arranged to classify this product into three different sizes, namely: —1½-in. to +¾-in., —¾-in. to +⅜-in. and —⅜-in. All the product less than ⅜-in. is considered as fines and is discharged through the screens only to the fines elevator No. 54 and to the conveyor on the conveyor floor. The second product of above ⅜-in. and not larger than ¾-in. is discharged into two sets of rolls to crush less than ⅜-in. The product of these rolls, however, is not discharged into the fines, but is returned to the screens to be screened out as fines, therefore avoiding the possibility of having oversize in the fines, due to the wearing or corrugating of rolls. The third classification, the product over ¾-in. and not greater than 1½-in. is discharged into the roughing rolls set at ¾-in. or less. This product is also returned to the screens to be rescreened and classified again. In other words, the screens and rolls are operated in closed circuit, therefore the entire product of fines must repass through the fine section of the screens before it can be delivered to the fines storage.

New Caledonia Ores

Exports of ores from New Caledonia for the three months, ended Mar. 31, as reported by the *Bulletin du Commerce* of Noumea were 5350 metric tons of chrome ore and 10,994 tons of nickel ore. In addition there were 2871 metric tons of nickel matte exported.

The annual report of the Mines Department for 1916 states that the Societé Le Nickel exported from New Caledonia during the year 30,000 tons of nickel ore and 2400 tons of 45% matte. The Societé des Hauts Fourneaux exported 3000 tons of ore and 3350 tons matte.

Sulphatizing with Weak Sulphurous Gases

By GEORGE C. WESTBY*

A method of utilizing the sulphurous gases derived from the roasting or smelting of pyritic ores, for the sulphatizing of oxidized copper-bearing ores, from which the copper is subsequently leached. Coarse and fine ores are treated separately, 90% and even higher recovery of the copper content having been effected in experimental work.

THE methods described in this article were devised to treat low-grade copper ores from the mines of the Nevada Douglas Consolidated Copper Co., at Ludwig, Nev. The ores contain a considerable percentage of acid-soluble aluminous and calcareous material, associated with copper minerals which are not rapidly acted on by dilute acids.

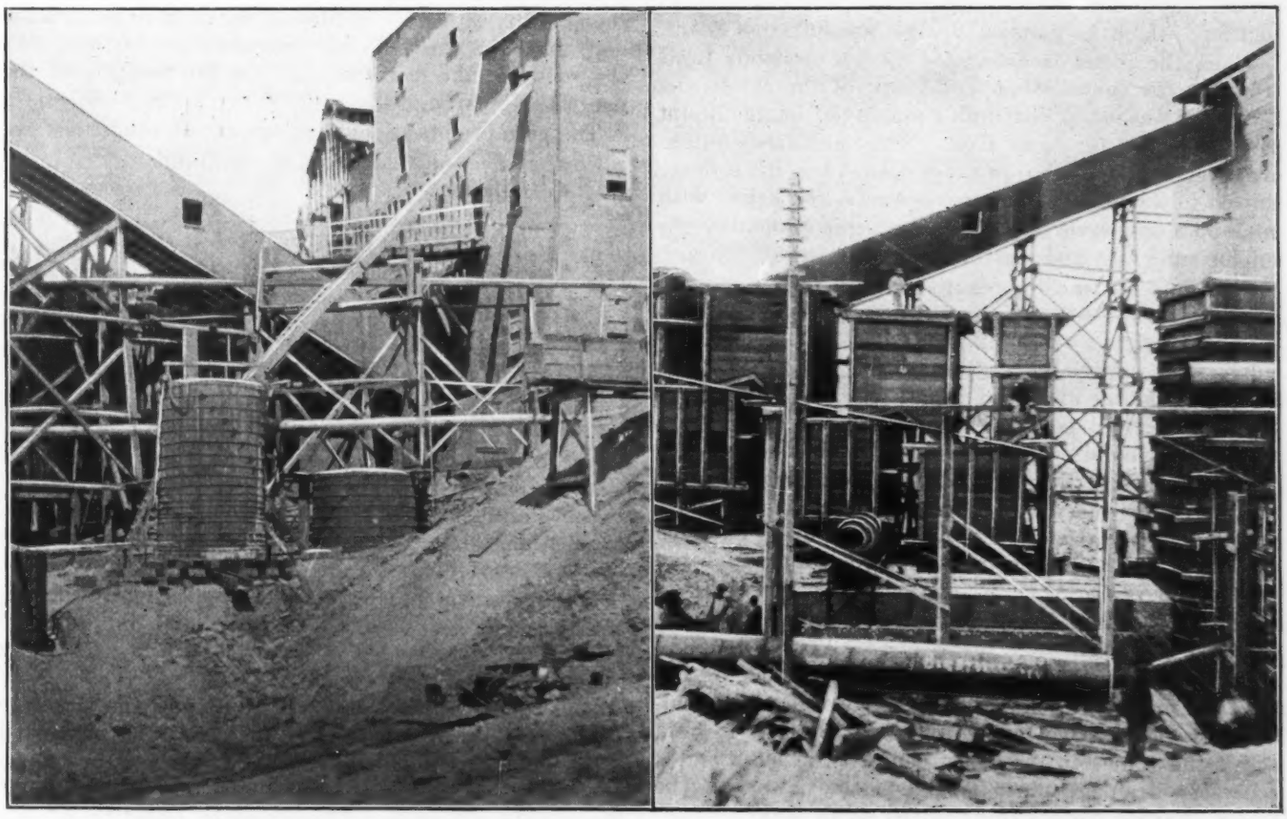
General conditions forbade the use of a smelting treatment, and the character and grade of the ore prevented more than consideration of accepted hydrometallurgical processes in which even moderately expensive reagents were called for.

Results of previous experimental work on smelter fumes carried on at the Utah Consolidated smeltery, from 1902 to 1906, suggested the scheme of treatment that was finally adopted. The process, in brief, consists of the utilization of sulphurous gases arising from roasting sulphide ores as a sulphating reagent on wetted oxidized ores or calcines, leaching with circulating liquors and precipitation of copper from the resultant solutions with iron.

The treatment ordinarily involves screening of the ore after crushing into coarse material and fines, and different apparatus for applying the fumes and liquor to the separated products, but so far as possible, differentiation of treatment has been avoided.

The sulphurous smoke used as the reagent in the process is derived from combustion of copper-bearing pyritic ores carrying about 18% of combined sulphur. The smoke is brought into direct contact with the ore, in the presence of vapor, steam or percolating liquor, and sulphatization is effected by the combined action on the wet ore of the hot sulphurous gases, excess oxygen in the smoke, oxygen with sulphites and water vapor.

Under the varying conditions the smoke has contained at different times, by volume, between 0.3% and 5.5% sulphur dioxide, but experience has shown that whether the gas was relatively weak or strong in sulphur dioxide, it was possible to utilize the fumes effectively in the extraction of soluble metal from the ores when treated under the established conditions of the process. It follows as a corollary that practically all the sulphur dioxide of the smoke can be abstracted from the fumes during moderately prolonged contact with soluble constituents of an ore.



No. 2 Experimental Tank Leaching Plant — Experimental Sulphatizer and Absorption Tanks
EXPERIMENTAL TANKS, SULPHATIZING TANK

*Ludwig, Nev.

In the progress of the treatment, the sulphide ore sent to the mill is crushed and ground to pass a 10-mesh screen and later passes from fine-ore storage bins to the roasters. The sulphurous gases emanating from the roasting ore are forced through flues leading to the treatment tanks, while the roasted material discharged from the furnaces is conveyed to the fines-treatment section of the plant.

The oxidized ores are crushed to pass a 1-in. ring. The material then is discharged on a 10-mesh screen and the oversize transferred to the coarse-ore system of the plant. The undersize passes to the fines-treatment apparatus.

Treatment of Coarse-Ores

The coarse ore is brought from the mill by a system of conveyors and charged to a series of closed tanks or towers. The sulphurous furnace gas is then forced through the interstices of the wetted ore in all the sulphurizers in commission. Simultaneously, the top of the ore columns are sprayed with liquor drawn from sump tanks which receive the drainage from the sulphurizing towers. The sump liquor is used over and over until it becomes strongly charged with copper; barren liquor and water then replace the cupriferous solution, which is pumped to the precipitation plant.

When the metal is exhausted to the economic limit from the ore contained in any tower of the series, the residue is washed by continuing a spray of barren liquor over the mass for some time. The sulphurous fumes are diverted, the discharge doors opened and the tailings sluiced to waste. The emptied tower is recharged with ore, and a new cycle is initiated by again admitting the sulphurous gases and starting the liquor spray.

The present leaching equipment of the coarse-ore treatment plant consists of six closed redwood towers, each of which is 40 ft. in diameter and 21 ft. high. Each sulphurizer is fitted with a filter bottom which is characterized by the use of spaced, parallel strips, of a triangular cross-section, pegged to supporting stringers that rest on a foundation of 12 x 12-in. timbers brought up from the bottom of the tower. The spaces between the triangular pieces are filled with insoluble rock approximately the size of an egg. This forms an effective means for disseminating the smoke volume through the orebody above the filter bottom, besides performing its function as a filter in the retention of slimes from the draining solutions.

A 4-ft. space between the filter and bottom of the tower is provided to facilitate free passage of the sulphurous gases. Oval apertures about 6 sq.ft. in area admit the fumes to the space beneath the filter and a 4-in. lead drainage pipe, flanged to the bottom of the tower, conveys the solutions to the sump tanks.

A system of balloon-shaped iron flues, lined with acid-proof brick, provide channels for the acid gases drawn from the furnaces. The fumes are preferably caused to flow first through the fine-ore sulphurizers in order to remove the flue dust from the smoke, before it is forced to the flues leading to the coarse-ore tanks. The flues, which are about 3 sq.ft. in area, are of a sufficiently small cross-section in relation to the volume of the smoke to insure that the velocity of the gases will be great enough to prevent any considerable deposition of flue dust in the flue.

A No. 8 Sturtevant hard-lead fan is situated near the bottom of each tank, and conduits are arranged so that the issuing gases may be drawn from the space between the gas-tight top of the tank and the surface of the ore column, and driven beneath and through the ore column of any other tank; in this way the sulphurous reagents may be driven through consecutive ore columns and progressively eliminated by combination with the soluble elements of the ore contained in the series of towers.

Redwood tanks, 20 ft. in diameter and 8 ft. high, are placed so as to receive by gravity the drainage from each sulphurizer. An outlet controlled by a valve at the bottom of the tank is connected with the inlet of a 3-in. lead pump. In operation the pump draws the liquor from the sump tank and forces it through the pipe serving the spray nozzles, which are located around the inner periphery of the top rim of the sulphurizing towers.

The time required for treatment of any column of ore necessarily depends on a number of factors, among which might be mentioned the following: (1) The volume of gas passing through the ore per unit of time; (2) the strength of the gas in SO_2, SO_3 and O; (3) the quantity of acid soluble constituents in the ore; (4) the quantity of copper in the ore, its mode of occurrence and generally the physical character of the ore; (5) the sizing of the material; (6) the temperature of the gas passing through the ore.

The results obtained under one set of conditions are given in the table. The strength of copper in the solution discharged to the precipitation system varied between 3 and 0.25% Cu, depending on the degree of ore exhaustion, the period of circulation and the general requirements of the plant.

TABLE OF RESULTS OBTAINED

Analysis of Ore		Screen Analysis	
Cu	3.11%	+ 2	10.7%
Fe	17.58%	+ 4	30.7%
SiO_2	59.80%	+10	31.6%
Al_2O_3	5.90%	+20	9.5%
CaO	6.40%	+40	5.9%
		+60	3.2%
		+80	2.9%
		—80	5.5%

Average percentage by volume of SO_2 entering tower	1.77
Average percentage by volume of SO_2 leaving tower	*0.86
Average fan pressure required for drawing gas through ore, oz.	2.37
Approximate power required for fan, hp	8.0
Approximate power required for pump, hp	2.0
Liquor circulated per minute (approximate average), gal	150

* This gas passed as heads to the next tank in series.

Figured on actual time of fume application to the ore, the following extractions, in round numbers, were obtained: 37% of copper extracted in 10 days; 82% in 20 days; 92% in 30 days; 98% in 40 days.

The comparatively slow action during the first ten days was largely due to the fact that the somewhat large percentage of lime present in the ore is more susceptible to the action of the sulphating reagents than the copper minerals. The absolute quantity of gas available for action on the copper minerals is therefore minimized during the first period of treatment.

Under another set of conditions with ore of a different character and containing 1.7% Cu, an extraction of 97.8% of the copper was made in 20 actual working days.

Treatment of Fine Ores

Attempts were made to apply the same method for treating fines as that described for leaching coarse ore, but it was found to be commercially impracticable to

force any considerable volume of gases through limited depths of fine ore, or even intermixed coarse and fine material (such as "mine-run") if the fines were argillaceous. In one case an experiment with wetted, rather granular fines represented by the screen analysis showed that a distributive surface of 38,200 sq.ft. would be required in forcing 5000 cu.ft. of gas per minute through 2 ft. of ore with a fan pressure of 3 oz. The screen analysis of the material tested showed: +10-mesh, none; +20-mesh, 64.2%; +40-mesh, 14.1%; +60-mesh, 7.0%; +80-mesh, 3.7%; —80-mesh, 11.0%.

A second experiment was made with a very argillaceous wetted ore and a degree of fineness represented by the screenings shown on +10-mesh, none; +20-mesh, 19.1%; +40-mesh, 35.9%; +60-mesh, 16.3%; +80-mesh, 8.7%; —80-mesh, 20.0%. This showed that almost 3,200,000 sq.ft. of transverse area would be necessary to provide a sufficient channel to convey 5000 cu.ft. per min. through 2 ft. of ore under a fan pressure of 6 oz. As the ore used in this experiment was representative of much of the oxidized ores of the Nevada Douglas Consolidated Copper Co., the conception of blowing sulphurous gases through masses of fines was abandoned as impracticable.

A method of fines treatment adopted for provisional use consisted in causing a spume of pulp and liquor to fall in retarded cascades through the sulphurous fumes. The method is applied in an apparatus arranged as follows:

Four tanks fitted with gas-tight tops, each 14 ft. in diameter by 20 ft. high, were set in line so that the tanks are consecutively two feet lower than those next in order. The tanks are fitted inside with a false bottom forming an inverted cone sloping at an angle of about 30° to a 7-in. discharge hole at the center. Above the sloping bottom a network of 1 x 1-in. pieces with 2 x 4-in. spacers, was built up from the periphery of the cone, and the whole is capped by a perforated cone sloping from its apex to the sides of the tank.

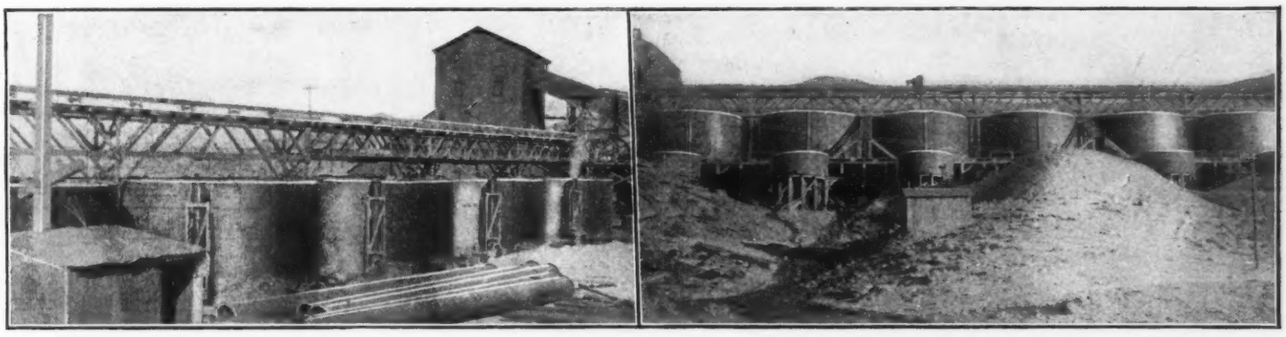
The tanks are connected by lead-lined gas flues which are flanged alternately to the upper and lower peripheral surfaces of the connected tanks, so that the sulphurous smoke is caused to traverse the height of the tank, but not necessarily in counter-current to the pulp. The lowest tank in the series is directly connected with the main flue from the furnaces, while the uppermost discharges to a flue which conveys the residual vapors and gases to the coarse-ore sulphurizers.

Each tank is equipped with a 7-in. corrosion sand pump direct-connected to a 25-hp. motor. The intake of the pump is flanged to a 7-in. steel-armored corrosion pipe joining the discharge hole at the center of the tank with the pump. A 6-in. armored corrosion discharge pipe rises vertically to the top of the tank and enters a square wooden conduit direct-connected with an elbow which is flanged to the rim of an opening in the top of the closed tank immediately above the apex of the upper cone. Branch conduits connect the main discharge conduits with one another.

In practice the mixed fines and liquor in the tanks drain to the discharge opening at the bottom of the tank, are drawn into the sand pump and again discharged to the apex of the cone at the top of the tower. The mixture is distributed over the entire top area of the network as it flows over the perforated cone, then flows in relatively thin films downward over the network and through the sulphurous smoke passing through the apparatus.

As the mixture flows back through the wooden conduits, a fractional portion is cut off by means of a movable deflection plate and caused to discharge to the next lowest tank in series, the lowest tank discharging to the washing and clarifying system; this discharge is approximately equal to the quantity of material charged to the upper tank. Close regulation may be effected by means of a float in the bottom of the tank and an electrically operated deflection plate.

The action of the hot sulphurous gases on the vast surface of shifting films of ore mixture brings about a rapid dissolution of the soluble constituents, but the absolute effect necessarily depends on the composition of the ore, rate of charging, ratio of pulp to liquor and other factors previously enumerated in the account of the coarse-ore treatment.



Leaching Tanks, Looking West — Large Tanks for Leaching, Small Tanks, Dumps

LEACHING TANKS, SULPHATIZING PLANT

Under the conditions of operation obtaining at different times during tests made with the apparatus described, it was established that when treatment was continuous and at the rate of about 50 tons per 24 hours, between 60% and 90% of the copper was extracted from the ore tested. Further, it was shown by experiment and deduction, drawn from results secured on many related tests, that to effect a 90% extraction from the most refractory of the Nevada Douglas Consolidated Copper Co. ores continuously charged to the upper tank at the rate of 250 tons per 24 hours, it would be necessary to use nine 30-ft. tanks in series equipped similarly to the 14x20-ft. tanks described, but using 8-in. sand pumps and 3-in. strips for the interior network.

While the general results of the method described for fine-ore treatment were sufficiently encouraging to

warrant commercial use of the process, it was an insistent fact that the rapid erosion of the working parts of the sand pumps introduced a serious item of costs for replacement. The logical means of escape from the difficulty seemed to be to effect a greater retardation of the fall of the mixture dropping through the apparatus, with a consequent diminished use of the pump. The development of this idea led to the case where the use of a sand pump was not required.

Of the methods and apparatus tried, the simplest means consist in sulphatization of the ore fines by bringing the fumes into contact with vast numbers of low heaps or piles of the dampened or wetted ore inclosed within a series of towers or chambers. In this method a latticework of superimposed staggered shelves is built up from the foundation of the towers and forms the support of the ore heaps under treatment.

The fine ore is charged to the top of the latticework and progressively falls from shelf to shelf throughout the tower as the upper layers of shelves become heaped to capacity and the excess material drops to lower levels.

When the tower is filled, the flow of ore is stopped and sulphurous vapors are let into the tower and around the ore heaps by the blower effect of a steam jet which is introduced in a flue entering the base of the tower. The jet thus serves a double purpose, for it economically impels the smoke volume through the tower and also introduces the water vapor that effectually disseminates moisture through the whole of the ore in the tower The heat of the gases and steam materially accelerate the chemical combinations in the towers.

Admission of the gases to the ore particles is facilitated by the construction of the shelves. These are formed preferably of three or more 1 x 1-in. strips of wood or 1 to 1½-in. rope. The strips are set sufficiently close to prevent the ore falling freely through the slits formed, but at the same time the aperture is wide enough to permit percolation of liquor from the ore heap and the free introduction of vapors to the bottom.

The space between parallel superimposed shelves is about 3 in., and the space between shelves in the same layer varies between 1 and 2 in. These distances provide ample room for free passage of the smoke volumes about the ore heaps and also for solid material to drop freely through the tower.

While it is possible to leach completely and wash the sulphatized heaps in place, it is usually better economy to sluice the sulphatized residue from the shelves into a Dorr or some similar type of classifier at a definite rate, then treating the material in accordance with current practice, finally diverting the copper solution to the precipitation system and discharging the tailings to waste.

It is apparent that in cleaning out the tower a murky or slimy liquor from the classifier could be used over and over until the tower was cleaned, thus avoiding dilution of the copper liquor.

Agitation of Ore Heaps Beneficial

Sulphatization of the ore can be much expedited by agitation or movement of the ore heaps during the treatment, but it is not certain that the advantages of accelerated action are great enough to warrant complications of apparatus and increased costs incident to the use of mechanical appliances.

A curve indicating the results obtained by treating 10-mesh ore with 1.2% SO_2 fumes by the shelf-tower method is shown in the accompanying diagram, in which the percentage extraction in any given time may be seen.

In order to express the processes described in terms of dollars and cents, the approximate cost items are given in the accompanying table:

COARSE-ORE SULPHATIZATION

Capacity of plant, 250 tons per day
Costs per Ton of Ore Treated

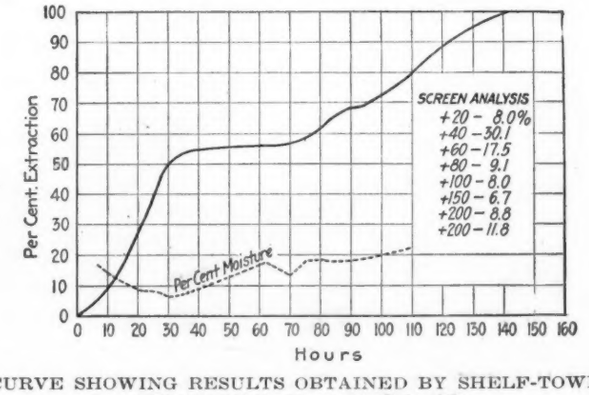
Sulphide-ore charge	$0.100
Depreciation	.065
Interest	.040
Labor (leaching and sluicing)	.056
Repairs	.012
Power @ 15c. per hp.-day (fans and pumps)	.054
Foreman, assay, office, etc	.060
Crushing (labor, power, etc., included)	.120
Precipitation—36 lb. of copper	.360
Switching, conveying, etc	.080
	$0.947

FINE-ORE SULPHATIZATION

Costs per Ton of Ore Treated

Sulphide-ore charge	$0.100
Depreciation	.080
Interest	.050
Labor	.056
Repairs	.012
Power	.012
Foreman, assay, etc	.060
Crushing	.120
Precipitation	.360
Switching, conveying, etc	.080
	$0.930

In conclusion it may be safely said that the processes described promise in their development to provide simple and economical means for treating low-grade ores containing metal soluble in sulphuric acid, especially



CURVE SHOWING RESULTS OBTAINED BY SHELF-TOWER TREATMENT OF 10-MESH ORE

where sulphides are associated with the ores and where considerable quantities of soluble gangue matter make other hydrometallurgical methods inapplicable. It is possible, too, that the processes could be economically used for the extraction of potash and soda from certain of the igneous rocks and to refine clays.

The reagent used in the processes is still dissipated in huge quantities through many smeltery stacks into the atmosphere wherever sulphide smelting is practiced. It is hoped that the experiments made and the data secured will define the way for one more solution of the smelter-smoke problem, at the same time solving a low-grade ore problem. Such a solution would be doubly valuable, since it would accomplish two desirable objects.

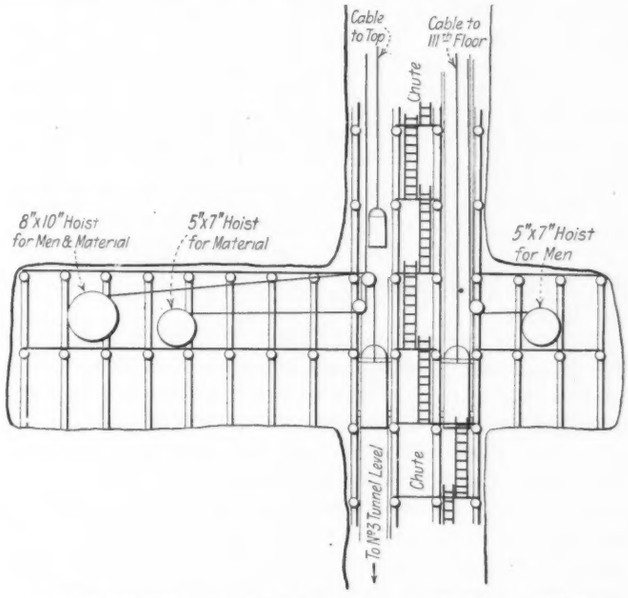
In any case the work has shown that a sulphurous fume carrying only 0.15% SO_2 by volume may economically extract copper from low-grade ores and in doing so produce as high as 3½% Cu as copper sulphate in solution. Since smelter smoke often assays 1½% to 2% SO_2 by volume, the significance of the figures submitted is believed to be both obvious and encouraging.

A Fourteen Hundred Foot Raise

By CHARLES H. FOREMAN
Mining engineer for the Hecla Mining Co., Burke, Idaho

Details of operations in raising approximately 1400 ft. where the principal difficulties ordinarily encountered in long raises were readily overcome; costs; wages on bonus system for all work done over a given distance each month.

THE Hecla Mining Co., operating at Burke, Idaho, recently opened up a body of ore remote from the courses that ventilate the old workings. It was proposed to drive a raise from the No. 3 Adit tunnel level to the surface, a distance of approximately 1400 ft., to properly ventilate the new workings and all development work contemplated in their vicinity. This raise would also greatly improve the ventilation in the old Hecla stopes. The work was begun in November,



ARRANGEMENT OF SKIPS AND LADDERWAY, HECLA LONG RAISE

1915, and has progressed steadily, except for a delay of four months, during part of which time a station was cut on the 57th and 58th floors.

The raise was driven about 9 x 18 ft. in the clear and is timbered by four sets of timbers, making three compartments. A timber slide is carried in one compartment, a chute in the center and a manway in the third. The ventilating pipe and air line are carried in the chute or center compartment, leaving the manway clear for the passage of men. The vertical distance between floors is 9 ft., while the horizontal distance between caps is 5 ft. Stull sets are used, the caps averaging 14 in. and the posts 8 in. in diameter. The floors are covered with 3-in. lagging, random width and 4 ft. 11 in. long.

Methods of Raising Used

A crew of four men on each shift consists of two miners, one timberman and one timberman's helper, two shifts being worked, the day shift going on at 7:30 a.m. and the night shift at 4 p.m. Room was made on the first floor for a timber hoist, and the four men hoisted their own material until the 40th floor was reached, when it was found necessary to add a hoistman, who also acted as general handy man around the bottom of the raise, to each shift. These men continued the raise until the 64th floor was reached, when the climb occupied so much time that some other method had to be adopted.

The work of raising was then stopped and a station fitted up on the 57th and 58th floors, the former being used as a working station and the latter as the hoisting station. The timber slide was fitted with guides from the No. 3 level to the 58th floor, and a working cage equipped with safeties was installed. An 8 x 10-in. air hoist was placed on the 58th floor and connected by a ¾-in. cable to a cage weighing 1700 lb.; a telephone, electric bell and flash system were installed on the 57th floor. The stations are equipped with electric lights.

It was necessary for the hoistman to climb the 57 floors on going to work in the morning and going off the night shift, but the day hoistman started in time to be at his station when the men were ready to go to work. Men, timbers and all supplies were hoisted to the 57th floor by this cage, the manway being used only by the hoistman and in cases of emergency.

A 5 x 7-in. hoist with ½-in. cable and steel bucket was installed on the 58th floor to hoist timbers and supplies up the timber slide from the 57th floor to the top of the raise. The raise at this point was offset, giving room for transferring supplies. A cager was added to the crew, to handle supplies from the No. 3 level to the 57th floor.

When work was again resumed in the raise, it was possible for the men to ride to the 57th floor, but it was necessary to climb from this point to the top. The work continued until the 112th floor was reached, when the climb was again getting to be a big problem and some other means of transportation was considered necessary to get the men to and from their work. It was not considered advisable to continue the guides from the 57th floor to the top of the timber slide as it would necessitate cutting another station or the installation of a much larger hoist. The ladders in the manway were taken out from the 57th to the 111th floor, guides were installed and a small cage holding four men and weighing 1100 lb. was handled by a 5 x 7-in. hoist using a ⅝-in. cable, set on the 58th floor. The ladders from the 57th to the 111th floor were placed in the chute set to be used only in case of emergency. This scheme allowed the men to ride to the 108th floor before starting to climb. All hoists on the 58th floor were fitted with indicators, and one man on each shift attends to all three hoists.

At the time this was written, the raise was on the 135th floor with about 33 floors to go to the surface. It is contemplated to raise the sheave in the manway compartment to the 141st floor, hoisting the men to the 138th floor, which will leave only about thirty floors

to climb to the extreme top of the raise. It is the intention to stop raising and to drift out as soon as broken or disturbed ground is encountered, estimated to be at about 100 ft. from the surface; the exact length of the raise is not known at this time.

Methods of Timbering Adopted

A set of timbers is not placed until the ground has been broken at least 16 ft. above the last set. This allows a set of timbers and 7 ft. of room for drilling. It has been found unsatisfactory to drill off a staging through the timbers, as it occasions loss of time and also increases the chance for blasting out sets. An average of 30 holes is drilled to the round. After drilling, the floor is covered with three thicknesses of 3-in. lagging and a V-shaped opening is placed over the chute to allow the miners to get to their work after blasting; the grizzly is taken off the top of the chute and the round blasted. Twelve feet of fuse is used for each primer; 300 sticks of 1¼-in. 40% gelatin is the average for each round. After blasting, the men replace the grizzly over the chute and the miners go to the face through the "V" opening, trim the back, and begin drilling from the top of the muck pile. It is generally unnecessary to draw any muck at this time. The second round is drilled, the V-shaped opening over the chute is raised, the grizzly is removed and the round is blasted. The miners go back to the face and trim the back, while the timbermen build a temporary muck slide to the chute, which is always carried two floors behind the other timbers. The muck is then drawn into the chute and the floors are cleaned for timbers. The timbers are hoisted to the top floor, and the whole crew is engaged in timbering. A gin-pole is not used for hoisting the timbers, as the weight of the cable causes the pole to spring and work loose. The timber is wrapped with a chain very close to the lower end, and the top end is held by a dog which is attached to the cable by a clevis, allowing it to be moved up and down the cable. The timber is hoisted up to the sheave wheel, the men landing it with their picaroons; the dog is removed from the end of the timber, which is then hoisted until the chain holding the lower end is near the sheave wheel, when it is removed and the timber landed on the top floor, above the sheave. After the timbers have been placed, the miners again start drilling and the timbermen raise the chute, timber slide and manway and do any necessary repairing. The chute is made of 6 x 10 x 9-in. fir and is held in place by a short piece of 6 x 10 about four feet long, which is dapped between the two center caps. The center of the chute is reinforced by 3-in. plank strapped around the front and sides. A 6 x 8-in. hole is cut in the chute on each floor so as to prevent an air cushion breaking the chute should the muck hang up and then suddenly release. The muck is never drawn down more than 10 floors from the top of the chute, except when making repairs. The chute is offset on the 30th, 57th and 111th floors and a chute lip provided. Repairs in the bottom of the chute do not necessitate drawing the entire chute. Movement of material in the timber slide is handled by a system of flash signals to the hoist, the wiring being carried to the top of the raise by a two-conductor reinforced weatherproof cable. It is necessary to box this cable, carried in the manway compartment.

The men have received a bonus for their work depending on the number of completed floors advanced each month. The miner's and timberman's helpers are paid $3.50 per day and the timberman $4 for an advance up to and including six complete floors per month. For every complete floor advance above six they receive an additional 25c. per day. This does not include the bonus regulated by the price of lead, which is additional. For the last three months the timberman has acted as "pusher" and has received an additional 50c. per day for supervision. Only the miners, timbermen and timbermen's helper receive this raise bonus.

Some very good time has been made in advancing this raise, 14 floors having been made in October, making a bonus of $2 per day; 18 floors in November, making a bonus of $3 per day; 16 floors for December making a bonus of $2.50 per day and 16 floors for February, making a bonus of $2.50 per day. January advance suffered on account of putting in guides from the 57th to the 111th floors.

Machines Repaired in Raise Station

Ingersoll-Rand CC-11 drills were used during the entire course of the raise, two being at the face and three on the 58th floor as extras. Water sprays are used on all machines, the water for which is hoisted from the 57th floor. The hoistman keeps the machines in repair on the 58th floor, where a complete set of repairs is at hand.

The raise is ventilated by two 10-in. No. 5 Buffalo blowers, operated by 5-hp. motors, one being on the first floor and the other on the 57th floor. No complaint has been made by the men on account of bad ventilation.

The costs for November were $253.93 per floor, or $28.22 per foot. December costs were $256.38 per floor, or $28.49 per foot. This includes all labor connected with the raise, cost of explosives, timbers and all supplies, but does not allow for the expense of cutting stations on the 57th and 58th floors.

No serious inconvenience has been encountered in driving this raise, and while several problems have presented themselvs during the course of the work, they have been met without serious difficulty.

Uses of Ferro-Uranium

A description is given by H. W. Gillett and E. L. Mack, in the *Journal of Industrial and Engineering Chemistry*, of experiments made with the object of obtaining iron-uranium alloys. By using pure uranium dioxide, a low-ash coke and pure iron as raw materials, it is possible, with the furnace described, to produce a ferro-uranium of any uranium content desired (40-70%) with carbon below 2%, silicon under 0.75%, vanadium under 0.5%, and traces of aluminum, sulphur, phosphorus and manganese.

The furnace used was of the tilting, direct-arc type with water-cooled magnesite hearth and sides. If experiments with such a ferro-uranium show that uranium steels high in uranium are not valuable, but that a little uranium is useful, and if the amount required is so low that the carbon introduced by the ferro-uranium is harmless, then the hearth might be uncooled and the ferro-uranium would contain 4 to 5% of carbon.

Conserving The Food Supply

It has been difficult to convey to the mind of the average citizen the meaning of the state of war in which this country finds itself. The courses that ought to be followed to bring it to the inevitable conclusion in the promptest manner have not been enunciated with sufficient force. In so far as the food situation is concerned, the address of Herbert C. Hoover, food administrator, made before a meeting of the Editorial Conference of Business Papers, at Washington, provides a clear statement of the actual condition and points out the lines to be pursued. Mr. Hoover's address ought to be read and considered by everybody. It is reproduced herewith.

WE have entered upon a war entirely unique in its character in that it is a war against ideas. The German people have adopted the theory of the survival of the strongest, the right of might, a biological interpretation of the theory of evolution, without any of that fine tempering which the Anglo-Saxon race has included in its sociological application through the belief that civilization spells the protection of the helpless. This has so permeated German character and German institutions that it has builded a system of state based on the subversion of all individual right to the interest of the state and holds out to its membership as compensation for the loss of individual liberty the prospect of mastership of the world.

Attacking an Idea

The military problem arising out of this situation becomes one, today, of defeating an idea. There might have been some hope that it could have been overcome in an early and crushing campaign, but the relaxation of effort by Russia has practically reduced us to a war of attrition. It is possible that with the infusion of democracy in Russia it may be re-created in strength and again enter upon the field of action, but at the present moment we can look for but moderate support from that source. We must adjust our minds to a long-continued war, a war of attrition, a steady grinding, and through the suffering of the German people to have brought them to a realization of the futility of their ideas and ambitions. Our objective does not consist of a destruction of the German state nor an extermination of the German people, but consists of effecting a revolution in the German mind.

A war of attrition means a long war and we must face the situation for two or perhaps five years.

In order that we may contribute our share to this and secure our ultimate objective, we must bring to bear every possible national resource. We have got to build ships to supply munitions and food; and ultimately we will have to supply soldiers at the front to maintain the strength of the Allied ranks.

To do all those things we have in effect the mobilization of the whole American people. This is not a war of the type that we have heretofore known, where the average proportion of civilians involved with the army amounted to the activities of approximately one or two civilians to each soldier in the field. We will require in some direction the activity of the whole population.

Now, to particularize a little on the food situation, our allies have hitherto drawn their cereals from Russia, Roumania and Bulgaria, and up to the last few months from Australia and India and from Argentina. The first three countries have been cut off since the war began. Australia and India are practically cut off from the shipping point of view, as it requires three times the tonnage of the Atlantic Seaboard. There has been a harvest failure in Argentina, and therefore an embargo. There has been a reduction of man power and some crop failure by frost among our allies. In consequence of all this they are faced with the necessity of finding, during the next year, probably over a thousand million bushels of grain, and finding it largely from North America. Normally, if we make no special effort, we should be able to supply about 400,000,000 bushels of grain, and I may mention that practically all grain in their hands today is largely interchangeable. Canada may supply 200,000,000 bushels, and therefore North America might, without effort, with the normal course of commerce, be able to supply about 60% of their necessities.

It is impossible to restrict the cereal consumption in Europe by 40% and maintain the constancy of those people in war. We can only hope to maintain their strength and constancy if we can do better than that. It should be possible, without disturbing the even course of North American life—because Canada is willing to take identical action with us—to increase our supply to Europe by another 15 or 20%. That will mean privation, but it will probably mean safety.

Therefore we have a problem in front of us of increasing the national surplus by every device, and growing out of that problem and out of our own economic conditions is another serious problem, of equal or more than equal importance, and that is the question of price regulation. If we allow our allies or the neutrals to again run free in these markets, we will again see episodes of the character we did in Chicago a short time ago, and we will see worse; possibly we will see an exhaustion of our cereals of next year before we have reached the following harvest.

Therefore we must restrict the exports from this country with one hand, and we must increase those exports by better management of our food supplies and greater economies and, incidentally, we must not allow this pressure to put the prices of the great staples of this country to a point where we will disturb our own social order.

Present Price Position Untenable

I doubt whether we could continue, even with the present level of prices, without a wage adjustment in this country, and consequent social disorder and loss of national efficiency. If possible we must have a lower level of prices yet high enough to stimulate the farmer to every effort, and we must maintain a greater stability of prices than during the last year. I speak of stability because my own belief is that one of the prime difficul-

ties of the consumer today, and of the producer as well, has been the widening out of the margin between the producer and the consumer steadily since the war began. This has not been due altogether to speculation, but due to the instability of the prices and the inability of the long chain of distributive organizations to protect themselves in the face of fluctuation, without taking more than normal margins. There has been a train of illegitimate speculation as well, which has accentuated the situation. Therefore, at least as a first step, we must try to get stability.

There are a great many panaceas to effect these ends which have been tried and abandoned in Europe. Europe has been a perfect laboratory of efforts to control food prices. Many of them, which were looked upon and have been looked upon for years as solutions of the economic difficulty have been abandoned after a short period as wholly impossible. One of those panaceas that is so frequently put forward in this country is the maximum price, but which can only be properly applied when coupled with absolute control of the country. We have got to find other devices, and the most hopeful device lies in carefully considering the breaks and disruptions in our distribution chain and repairing links controlling abnormal action and even introducing into it balance wheels of some kind that will serve until normal checks and balances return to the world. Perhaps I may be more clear on that if I take one single commodity, and that is wheat. The price of wheat can be compared to a number of connected vessels; one of those vessels in Petrograd, another in Warsaw, another in Rome, another in Liverpool, another in Buenos Aires and another in Sydney, and so on throughout the world. Today all those vessels are disconnected. Therefore a sudden coincident demand, not necessarily speculative, makes a fluctuation in our prices far beyond the normal and the situation lends itself to speculative action.

The Power of Embargo

The Government has asked for the power of embargo. The power of embargo does not mean a prohibition of the export of cereals, but means export under conditions, and the conditions under which these cereals are to be exported must have a bearing on the price, and it appears to me and to the other gentlemen who have studied that question that with the embargo in our hands we can stabilize the price without necessarily entering upon a total disruption of the distributing trades.

There is also the case of sugar. In the case of sugar we are importers. We are competing in Cuba and in other sugar markets between ourselves, and with others, and a little bit of coördination would probably stabilize the price of sugar without injustice to our Cuban friends and enable us to stabilize the price over the entire year, instead of having the wildly fluctuating price that we have had ever since the war began.

If we can stabilize those prices, I think you will find the margin between producer and consumer will diminish materially without damage to the legitimate profits of the distributing trades or to necessary returns to the producers.

I only want to point those out as methods of food administration and to show you that food administration is not food dictatorship in the sense of the headlines.

Now, there are other engines in food administration. One of them is the question of national conservation of waste. There are certain types of waste that are national. There is the temperance question. I do not intend, from any ethical point of view, to discuss the quantity of grain that could be saved by the stoppage of brewing and distilling, but we may need to consider that question as a war measure in order to protect our allies and it becomes simply a question of the volume of real saving, and that can only be determined by the most careful investigation.

There are innumerable small leaks in our distributing system which can be corrected without hardship. I will mention just one, to indicate to you their character. The return of bread to bakers from their retail dealers amounts to a probably national loss of something like 2% of our flour. That is a leak that has grown up despite the effort and the will of the trades themselves. No one is so anxious to have that corrected as the baker.

Stopping up the Leaks

There are also the household leakages, and there is a large field for effort without any drastic regulations as to rationing the people. My own view is that our people should eat plenty, but they should eat wisely and without waste. There are four directions in which, if we could secure the coördinated effort of the women in this country, we could accomplish an enormous amount of saving. The first of those directions is in the nature of substitutions. If we could persuade the housewives of the country to substitute local products for those from distant fields, substitute vegetables in the summer for the staples, and to substitute the staples which we do not wish to export for those which we do wish to export, we could probably revolutionize our export balances.

There is also the question of reduction in actual eating, as our people probably have eaten an average of 40% more than they need to maintain their health. I do not know that we will ever have gained a great deal on that line, but it is still an abstract fact that it leaves a broad field for consideration. Then there is the question of household waste; the doctrine of the clean plate.

There is the question of instructions in elementary diatetics in the household. There are hundreds of avenues through which we could improve the average character of housekeeping from a war standpoint.

Now there is a good deal of fear throughout the country as to the character of the food administration. I feel general support in the country to the President's wish to set up a Food Administrator, but in some quarters a perhaps cultivated alarm that it will lead to a total disruption of commerce. It is difficult to impress anyone with the fact that in setting up an administration of that kind, in asking for unusual powers, these powers may not be used for any purpose but to accomplish solely our national objective. Our objective is to win this war, and if it is necessary in order to win this war that we should use those powers, I believe the common support of the American people will be behind us, and believe that if these powers are given to the President by Congress, it will materially contribute to winning the war and will do so through the voluntary and willing support of the people.

Since Mr. Hoover expressed his willingness to answer any questions, the following was asked:

Considering this food problem, the difficulty seems to be in getting the grain to Europe. That seems to be more important than the actual ships themselves. Does it not seem that it will be more important to protect each individual shipment, by convoying ships, so that when the grain leaves this country, it will be sure to reach our allies, and not be sent to the bottom of the ocean? It is not the ship that you want to get over there, but the cargo.

In reply, Mr. Hoover said that the question of convoying ships had been threshed out by every naval department time and again. "The difficulties of convoying ships are very great. Convoying ships means the running of a lot of vessels together, and then the speed of the entire fleet is equal to that of the slowest. Also they must load them all together, and thus congest the ports at the time of loading, and they must all be unloaded together, congesting the ports at the time of discharge. There are numerous problems of that kind connected with the convoying of ships. I do believe that we have the best naval officers, including our own and those of England, that there are in the world, and that they have done all that can be done and will do all that can be done to protect our vessels and to insure their safe arrival at their destinations.

"Another speaker pointed out that Mr. Hoover had already told something about how the press could help out, by its coöperation, and suggested a repetition at this time.

Support of the Food Administration

"Mr. Hoover explained that he had said to the press representatives of Washington that a great deal of the success of food administration revolves around the earnest support of the press of any food administration, that the personal element in administration must be eliminated. We can make no conservation of food without causing complaint from a small minority, and if the Food Administrator is to have the full benefit of every individual criticism arising from the exaggerated views of some individual sacrifice, the whole will break down in a month's time. In any food administration we are bound to secure sacrifice somewhere. The vast majority of it will be willing and voluntary. We have the right to ask for fair criticism and for support of food administration as a national institution as against the complaint of any minority individuals. Such support is to be considered essential.

"Furthermore, I have asked the press representatives not to personalize the food administration. Our people have a perfect mania for personalizing everything. Food administration is not personal, and it will be composed of probably several hundred of the best men that can be chosen in the country. It is an institution, and as an institution it can withstand shocks. An individual cannot stand all the shocks and survive. Therefore I am anxious that if the administration is set up by the President after Congressional action, my own personality shall be submerged in an institution and my own name disappear in the press—that it should be simply the Food Administration." Mr. Hoover has never favored the capitalization of his name in connection with the activities in which he is interested.

Iron and Steel in Canada

The production of iron and steel in Canada, as reported by the American Iron and Steel Asociation, showed a large increase in 1916. The make of pig iron has been as follows for three years past, in gross tons:

	1914	1915	1916
Basic	331,456	660,369	851,453
Bessemer	184,053	13,714	12,575
Foundry	174,346	125,769	181,748
All others	16,117	25,568	23,765
Total	705,972	825,420	1,069,541

The increase was almost wholly in basic pig. Bessemer iron fell off to an insignificant proportion of the total.

The total production of cast-iron gas and water pipe and fittings and cast-iron soil and plumbers' pipe and fittings in Canada in 1916 is estimated at 43,850 net tons, as compared with an estimated production in 1915 of 53,700 net tons, a decrease of 9850 tons.

The production of steel ingots and castings for three years has been, in gross tons:

	1914	1915	1916
Openhearth	556,910	884,736	1,245,488
Bessemer	186,158	22,521	10,968
Other kinds	284	5,498	30,053
Total	743,352	912,755	1,286,509

Of the total last year 1,255,196 tons were ingots and 31,313 tons direct castings. The large increase was entirely in openhearth steel. A considerable part of the increase in other kinds was in electric steel. The production of steel in 1916 exceeded that of pig iron by 216,968 tons. Some of this was due to the use of imported pig, but the greater part to the use of scrap in the openhearth furnaces.

The production of finished rolled iron and steel for three years past has been as follows, in gross tons:

	1914	1915	1916
Rails	382,344	209,752	81,497
Structural shapes and wire bars	59,050	114,829	174,490
Plates, sheets, bars, etc.	218,125	328,737	707,823
Total	659,519	653,318	963,810

Of the total ouput of finished forms last year 887,332 tons were of steel and 76,478 tons of wrought iron.

It will be noticed that rail production last year fell off heavily, due in large part to the extraordinary demand upon steel works for war steel. In 1915 Canada shipped a considerable quantity of rails into the United States. There was also a heavy decrease in new railroad building last year.

The production of iron and steel cut and wire nails in Canada in 1916 amounted to 1,757,000 kegs of 100 lb., as compared with an estimated production in 1915 of 1,636,000 kegs. Cut or wire nails were made last year by nineteen works in five provinces.

The total of finished steel was 69% of the steel ingots made, a rather low proportion which was probably due to heavy discards required on shell and other war steel.

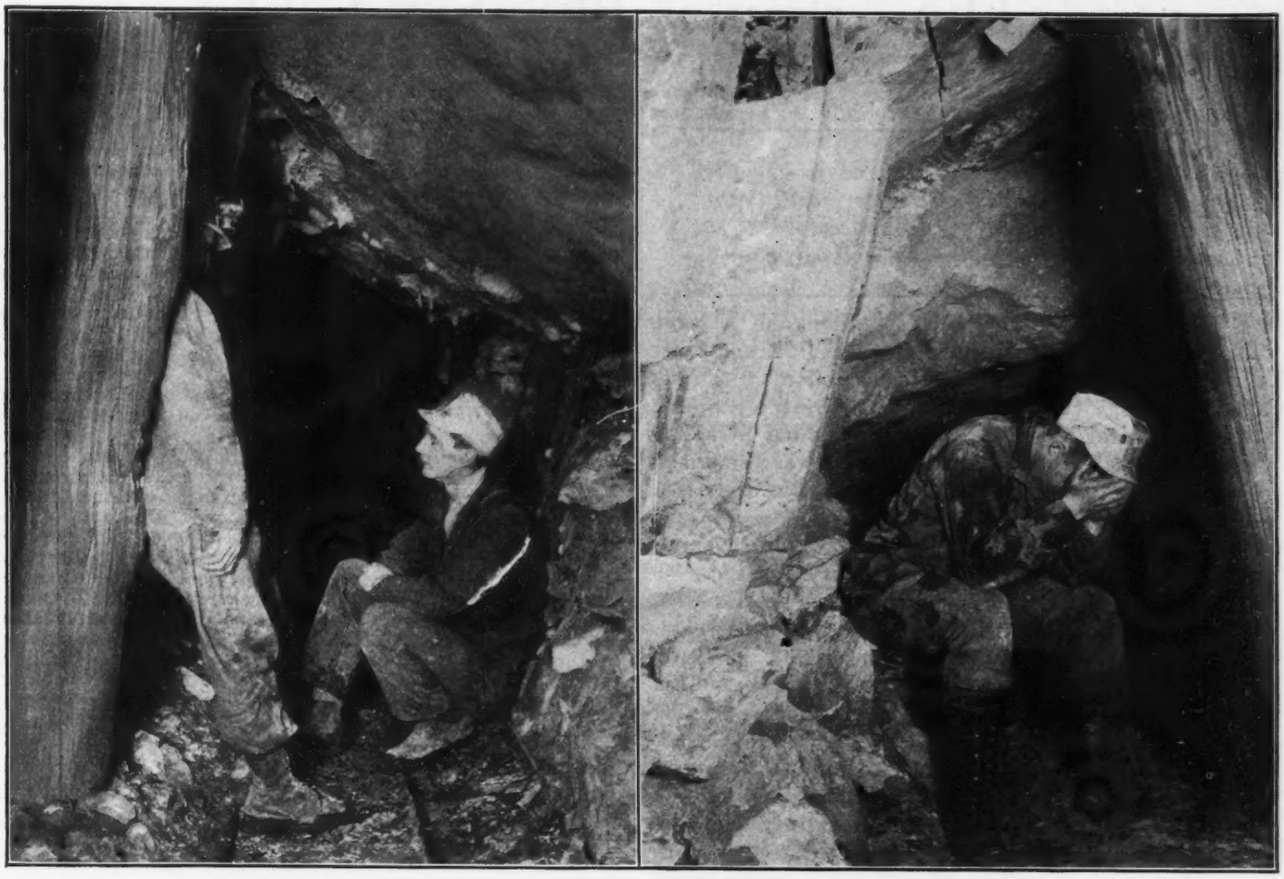
Estimates Prepared by the lumber committee of the advisory commission of the Council of National Defense show that 2,000,000,000 ft. may be used for purposes directly connected with the war in the next 12 months. This sounds colossal, but is actually about 5% of one year's lumber production of this country. Construction of the 16 cantonments to house the new army will require about 500,000,000 ft. Second in quantity required comes the wooden shipbuilding program, now estimated at 400,000,000 feet.

Safety First in California Gold Mines

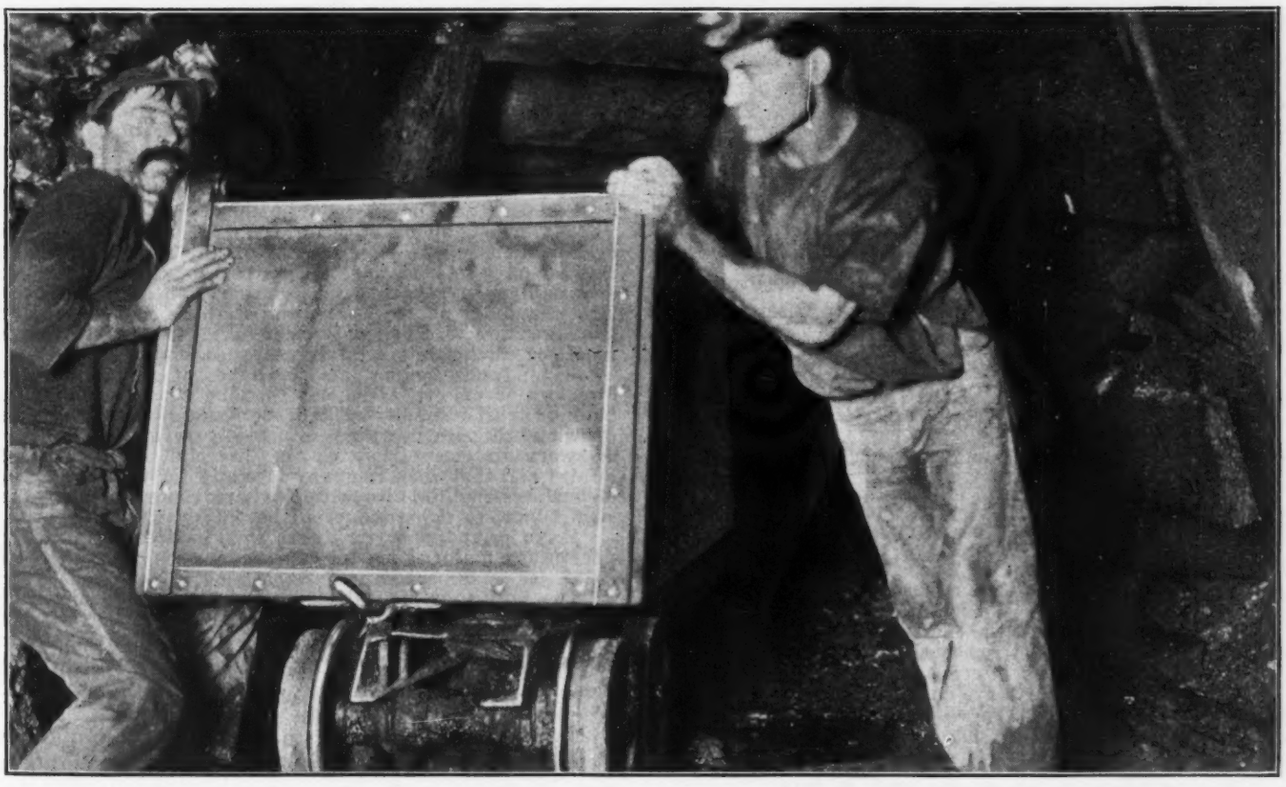
Loose rock, like a rattlesnake, is harmless only when under foot. Which man is doing the safer job?

The safest way home may be the longest way round. But he took the short cut through dangerous ground

THESE VIEWS, WITH AMPLIFIED CAPTIONS, ARE USED AS SAFETY-FIRST POSTERS IN CALIFORNIA MINES



If you must "taper off," find a safe place. Stop taking chances. Put carelessness behind you



Crushed against the wall of the drift. Because he did not use his head and step to the other side where there was plenty of room

BY EDWIN HIGGINS, SAFETY ENGINEER FOR THE CALIFORNIA METAL PRODUCERS' ASSOCIATION

The Arkansas Blue-Sky Law

By JOHN T. FULLER
Consulting Engineer, Little Rock, Ark.

The legislation commonly referred to as "Blue Sky Law," was received with bitter hostility, but since its operations have been understood, it has commanded respect and even enthusiasm.

ALTHOUGH considerable attention and a large amount of space both in the technical and daily press was devoted to the discussion of the so-called "Blue-Sky Law" passed recently by the State of Kansas and later by several other states, but little has appeared recently with regard to these laws. This lack of attention has probably been due to the fact that as a result of test cases in the courts many of these laws have been declared unconstitutional as contravening either the state or the national constitution or both.

The first law of this nature in the State of Arkansas, which has been in successful operation for three years, was approved by the state legislature on Mar. 28, 1913,[1] and was defined as "an act to provide for the regulation and supervision of investment companies and to provide a penalty for the violation thereof." Under this act every individual, corporation, copartnership or company and every association (other than national banks and corporations not organized for profit) either domestic or foreign, which sold or sought to sell any stock, contracts, bonds or securities of any kind or character other than bonds of the United States or of some municipality authorized to issue bonds of the State of Arkansas, and notes secured by mortgages on real estate situated in the State of Arkansas, or sell building stock or loan investments to any person or persons in the State of Arkansas, were obliged to obtain permission from the state bank commissioner.

I will not go specifically into the requirements of this act, for after its constitutionality had been upheld, the act was repealed and another of a similar nature, but much more specific and in clearer and more concise language, was passed by the legislature in 1915. The constitutionality of the first act was attacked by injunction proceedings in the United States District Court by the Standard Home Co., of Birmingham, Ala., on the grounds that it was a violation of the Constitution of the United States, and of the Constitution of Arkansas.

Upholding the Legality of the Act

In his opinion handed down Oct. 15, 1914,[2] Judge Trieber, in denying all the complaints and sustaining the act, makes the following significant statements:

> The dockets of the national courts have been crowded for the last few years with criminal prosecutions of persons charged with the use of the mails of the United States in carrying out fraudulent schemes by so-called investment companies and persons offering allurements to "get rich quick." But those courts are only clothed with jurisdiction to prosecute those who, in carrying out their fraudulent schemes, make use of the mails, and then only after the commission of the offence. This necessarily affects only a small portion of those engaged in such schemes and but rarely acts as a preventive. The state alone can provide for the prevention and punishment of all who commit frauds, although the mails are not used for their accomplishment, and enact laws to prevent the commission of these crimes. Legislation to prevent crime is of greater benefit to society than the punishment of the offender after the crime has been committed and innocent persons have been made to suffer. Statutes enacted for such purposes ought not to be declared invalid by the courts upon slight grounds even if cases can be imagined where they may work an injustice.
>
> The granting of the privilege to do business of that nature in the state by a high official is, to a certain extent, an assurance to the public that the corporation is properly managed. It is not only his privilege but duty to exercise great caution to satisfy himself that not only the scheme, but the men administering the affairs of the company, are of such character and standing and have such a financial interest in the success of the scheme as to give reasonable assurance to investors that their money will not be dishonestly dissipated or misappropriated. Nor can there be a reasonable objection to the provision of the statute that this information should be accessible to those who are inclined to invest their money in the securities of that association. There can be no better means of information than the sworn statements of the officers showing the condition of their corporation. . . . In a classification for governmental purposes there cannot be an exact exclusion or inclusion of persons and things.

The present act has never been attacked by any legal proceeding. As already stated, it is practically the same as the old act except that it is more clearly worded. Under the powers granted to him by the act, the bank commissioner has made the following requirements:

1. No advertisement, pamphlet, circular or other document shall be issued, circulated or delivered by any investment company, or its agent, within this state unless a copy thereof shall first have been filed with the bank commissioner of Arkansas, nor after such company has been notified of objection thereto by said bank commissioner.
2. For the purpose of promoting any investment company, or promoting the sale of securities of any such company, or the securities of any other company, no person, either as principal or agent, shall sell, or agree or attempt to sell, within this state any securities in such company, or of any other company, unless the contract of subscription or of sale shall be written or printed and contain a provision in the following language, in bold type (the per cent. to be determined by the bank commissioner):

"No sum shall be used for commission, promotion and organization expenses on account of any share of stock in this company in excess of.....per cent. of the amount actually paid upon separate subscriptions for such securities. The remainder of such payments shall be held by the organizers, directors and officers of such company as bailees until the company is actually ready for business."

3. All funds coming into the hands of such organizers, directors or officers as bailees shall be deposited with any bank or trust company of this state and shall not be withdrawn until such company is actually ready for business. A sworn statement showing the financial condition of its affairs and that such company is ready for the transaction of business shall be filed with the bank commissioner before such funds, so deposited, shall be withdrawn.
4. No company or its agent shall misrepresent to any person any material matter concerning such company or its securities.

The failure or refusal to comply with the requirements above enumerated shall be grounds for forfeiting all right to do business in this state, and the permission theretofore granted may be revoked.

Comprehensive Form Filled Out by Applicant

The applicant must also fill out a form containing complete information in regard to the name, capitalization, stock and bond issue, assets and liabilities, profit and loss account for the last year or half-year, the

[1] State of Arkansas—Act No. 214—Mar. 28, 1913.

[2] Arkansas Blue Sky Law, Standard Home Co. vs. John M. Davis, state bank commissioner and State of Arkansas, et al.

holdings, salary and time devoted to the work by the officers and board of directors of the company. Appended to this form are a list of the stockholders, description of physical holdings of the company, a trial-balance sheet of the company's books, and a statement of receipts and disbursements. In addition a blank stock certificate, copy of the constitution and articles of association are included, together with the form references in regard to the character, responsibility, and financial standing of each director and eight references in regard to the company itself. The form is completed with the usual signature and notaries' acknowledgements. Under section 7 of the present law the bank commissioner is empowered "to demand from any investment company seeking to come under the provisions of this act any further information other than such investment company is required to furnish under the provisions of this act which shall be necessary to properly qualify him to pass upon all questions that may come before him. He may make or have made under his direction a detailed examination of such investment company's property, business and affairs, which examination shall be at the expense of the applicant, etc."

Under the provisions of this section the bank commissioner requires as a condition for his permission to sell stock that all mining companies, oil companies or gas companies submit their property or holdings to the examination of a competent mining engineer or geologist of his choosing. By agreement with the commissioner the compensation fixed for these examinations is very low and most advantageous to the applicant. It will of course be understood that an exhaustive report on a mining, oil or gas property is not contemplated, but simply an assurance to the commissioner that in the judgment of the examiner the property offered gives a reasonable promise of financial success if properly managed, although the amount of stock which the commissioner will permit to be sold within the state is based fundamentally on the physical value of the property.

Results of the Act in Arkansas

Aside from the written report of the actual physical conditions, a verbal report of the examiners' impressions of, and the impressions of the people living in the immediate community of the applicants is made, which, as Judge Trieber said, is of as great weight as the physical report on the property itself.

In no case has the time required to make these examinations exceeded six days, and in the majority of cases three days including traveling time has been sufficient. This short time of course presupposes a fairly comprehensive knowledge of the mining conditions and geology of Arkansas and of the immediately adjoining states. The applications for permits of mining, oil or gas companies have thus far been confined to Arkansas, Missouri, Kansas, Oklahoma, Texas and Louisiana.

Under the law the bank commissioner has to date examined or had examined more than 200 applications for authority to sell investment securities, a majority of which have been approved. This list of course does not include many who sought to sell stock, but who, on discovering the rigid censorship to which they would have to submit, voluntarily gave up the idea of entering the state. The applications denied have refused the privilege of selling and offering for sale nearly $2,000,000 worth of holdings in Arkansas. The chief reasons for the denial of permission to sell were that the statements and declarations made by the applicants were not such as would warrant the finding that an investment in such enterprises would be either safe or profitable.

Applied to Mining and Oil Companies

In the case of mining, oil or gas companies the writer recalls but two cases where the physical valuation of the property was the determining factor for denial. One case was that of an oil company in Oklahoma, trying to sell stock to drill wells in an absolutely unproved and "wildcat" territory, and the other the case of a cement company in Arkansas that sought to place a valuation of $1,000,000 on a few acres of limestone. Neither of these succeeded.

The raw swindler and "get rich quick" promoter takes one look at the requirements and as a rule departs to other fields less carefully guarded. The general effect of the law has been that only *legitimate, or such schemes which in the honest personal opinion of the applicant are legitimate, ever attempt to get by.* The writer has frequently been able to obtain the views and the opinions on this law held by the average applicant with something legitimate to sell and, it might be added, of quite a few who had nothing to sell and who wanted to sell it badly. It has been interesting to note the gradual but definite change of opinion from that of sullen, bitter hostility, to that of enthusiastic approval after better acquaintance.

The advantages to legitimate business under this act become apparent to the approved applicant as soon as he starts to market his securities. To begin with the unscrupulous competition of the faker has been eliminated or greatly restricted. The fact that the project has been approved after a rigid investigation by the state bank commissioner (although it is stated on the permit that the security is not recommended although approved) gives the security an immediate standing with the investing public. The only trouble has been that at first the public was inclined to assume that an approval also carried a guarantee. In the case of mining, oil and gas companies, in addition to the approval of the commissioner they have the advantage of the mining engineers' report, which they are at liberty to publish.

Its Advantage to Legitimate Business

I have been told any number of times by successful applicants that when first faced with the requirements, they were inclined to feel that they were unreasonable, needlessly severe and costly, but that having successfully passed inspection, they had found that the approval of the commissioner, together with the report on their property by an engineer approved both by the state bank commissioner and the commissioner of mines, was of inestimable advantage to them not only within the state but outside and that these advantages were worth to them many times the cost and trouble entailed in obtaining the permit, even though it appeared great at first.

Milling Costs at the Inspiration and Bunker Hill Plants

The milling costs noted in the yearly reports of the Inspiration and Bunker Hill companies provide a basis for an interesting comparison of two mills operating in a different way on different materials.

A COMPARISON of the milling data and costs at the mills of the Inspiration Consolidated Copper Co. at Miami, Ariz., and the Bunker Hill & Sullivan Mining and Concentrating Co. at Kellogg, Idaho, are interesting. The former treats a copper ore of the porphyry type, while the latter is concentrating lead-zinc ores. At the Inspiration, water is scarce and means have to be taken to impound and reclaim it, while at the Bunker Hill, water is plentiful and no care need be taken in its use.

The copper in the Inspiration ore occurs principally in combination with sulphur, but partly as oxide. The sulphide is readily separated from the waste rock, by either flotation or gravity concentration, or by a combination of both. The oxide, however, gives poor recovery by either means. The ore milled in 1916 averaged 1.548% copper, and the recoveries from the sulphide copper were 90.95%, while of the copper in oxide form, only 16.60% was recovered, making an average recovery of 74.86%. Of course it is to be taken into consideration that the assay of the ore containing sulphide was 1.213% copper, while in the oxide ore the copper only averaged 0.335%.

At the Inspiration mill during 1916, according to the company's report, 5,316,350 tons was milled, making an average of 14,850 tons per day. The general tailings assayed 0.397% copper, and the copper in the general concentrates averaged 30.688%. In the flotation concentrates the copper averaged 37.5%, and in the table concentrates, 11.23%. The concentrates produced per ton of ore amounted to 0.0377 ton. The water used per ton of ore amounted to 1108 gal. The water reclaimed in tanks at the foot of the mill amounted to 354 gal., that reclaimed from ponds, 528 gal., and new water from the pumping station, 226 gal., the total being equal to the water used per ton of ore.

The cost per pound of copper derived from concentrating ores was as shown in the following table:

COST OF COPPER AT INSPIRATION

	Cents per Pound
Mining	2.702
Coarse crushing	0.125
Ore hauling	0.069
Concentrating and royalty	0.243
Concentrate hauling	0.006
Total	5.145

Smelting, freight, refining, marketing, etc., cost 3.528c., making a complete total of 8.673c. per ton of ore treated. The total amount of copper recovered was 119,431,389 tons.

BUNKER HILL & SULLIVAN

At the Bunker Hill & Sullivan plant, conditions are entirely different, and according to the company's report, costs and milling data are given in much greater detail. The following tables show the complete records of mill operations at that plant.

The concentrators were in operation for the full year, during which 10 days were lost, as follows: 22 hours

DETAILS OF COST

Details of Labor, Supplies, Etc.	Aver age per Ton for the Year	Last Year
Superintendent and foreman	$0.014	$0.013
Shift bosses and sampler	.010	.009
Crushermen	.003	.002
Conveyormen	.006	.005
Machinemen	.084	.064
Oilers	.018	.015
Roustabouts	.004	.006
Laborers	.011	.007
Watchmen	.006	.006
Experimental labor	.001	.002
Repairmen	.....	.....
Screens	.007	.005
Belts	.020	.010
Buckets	.001	.001
Roll shells	.003	.002
Ring dies	.002	.001
Huntington-mill parts	.001	.001
Chilean-mill parts	.....	.....
Concaves	.001	.....
Mullers	.005	.004
Spindles	.002	.....
General machine parts	.008	.004
Pebbles	.002	.0
Oil and waste	.005	.002
Miscellaneous supplies	.056	.003
Pulleys	.003	.03
Liners	.006	.001
Trommel screens	.007	.005
Flotation supplies	.004	.....
Machine-shop repairs	.005	.004
Electrical repairs	.003	.004
Building repairs	.024	.016
Mill-shop repairs	.020	.022
Electric power	.085	.083
Compressed air	.....	.005
Water and water power	.010	.009
Electric light	.005	.005
Heating	.023	.014
Assaying	.009	.006
Train service	.002	.001
Contingent expense	.012	.007
Depreciation	.042	.031
Administrative expense	.017	.012
Taxes and insurance	.028	.021
Free rent, light and water	.001	.001
Fire protection	.001	.002
Experimental	.001	.001
South mill operation	.023	.009
Reconcentrating expense	.....	.001
Total	$0.601	$0.425

on account of oiling motors; 22 hours on account screens, elevators and rolls; 57 hours on account holidays and miners' picnic; 17 hours on account pumps and power off; 2 hours on account chilean mill; 4 hours on account classifiers; 4 hours on account belts, conveyors and tables; 2 hours on account slush ice; 90 hours on account general repairs; 20 hours on account transmission rope. During the year 475,784 tons of ore was concentrated, making the average work of the concen-

CRUSHING AND CONVEYING

Details of Labor, Supplies, Etc.	Average per Ton for the Year	Last Year
Crushermen	$0.003	$0.002
Conveyormen	.006	.005
Roustabouts	.001	.001
Laborers	.006	.006
Repairmen	.....	.....
Screens	.....	.....
Belts	.014	.007
Buckets	.001	.001
Roll shells	.002	.002
Roller shells	.....	.....
Mullers	.002	.002
Spindles	.002	.....
General machine parts	.002	.002
Oil and waste	.....	.001
Miscellaneous	.005	.....
Pulleys	.....	.....
Liners	.....	.....
Machine-shop repairs	.001	.001
Electrical repairs	.....	.....
Building repairs	.002	.002
Mill-shop repairs	.003	.003
Electric power	.027	.025
Total	$0.077	$0.061

JIGGING

Details of Labor, Supplies, Etc.	Average per Ton for the Year	Last Year
Machinemen	$0.024	$0.018
Oilers	.009	.008
Repairmen	.....	.....
Roustabouts	.....	.....
Screens	.002	.001
Belts	.001	.001
General machine parts	.001	.....
Oil and waste	.....	.001
Miscellaneous	.009	.....
Pulleys	.....	.....
Liners	.004	.....
Electrical repairs	.....	.....
Building repairs	.004	.005
Mill-shop repairs	.002	.002
Electric power	.012	.013
Water and water power	.005	.004
Total	$0.073	$0.055

GRINDING

Details of Labor, Supplies, Etc.	Average per Ton for the Year	Last Year
Machinemen	$0.023	$0.018
Roustabouts	.....	.....
Laborers	.....	.....
Repairmen	.....	.....
Screens	.00e1	.....
Bets	.002	.....
Roll Shells	.002	.....
Ring dies	.002	.010
Huntington-mill parts	.001	.....
Chilean-mill parts	.....	.....
Concaves	.001	.....
Mullers	.003	.002
General machine parts	.001	.001
Pebbles	.002	.002
Miscellaneous	.010	.....
Pulleys	.....	.....
Liners	.002	.....
Trommel screens	.....	.....
Electrical repairs	.....	.....
Building repairs	.....	.....
Mill-shop repairs	.003	.003
Electric power	.024	.022
Total	$0.077	$0.050

CONCENTRATING

Details of Labor, Supplies, Etc.	Average per Ton for the Year	Last Year
Machinemen	$0.024	$0.019
Oilers	.009	.003
Roustabouts	.001	.002
Laborers	.002	.....
Experimental labor	.001	.....
Repairmen	.....	.....
Belts	.002	.002
General machine parts	.003	.001
Oil and waste	.002	.....
Miscellaneous	.013	.....
Pulleys	.001	.....
Flotation supplies	.004	.....
Liners	.....	.001
Machine-shop repairs	.005	.003
Building repairs	.002	.002
Mill-shop repairs	.006	.011
Electric power	.019	.018
Compressed air	.....	.005
Water and water power	.004	.003
Contingent expense	.001	.....
Reconcentrating expense	.....	.001
Total	$0.100	$ .76

GENERAL MILLING EXPENSE

Details of Labor, Supplies, Etc.	Average per Ton for the Year	Last Year
Superintendent and foremen	$0.014	$0.013
Shift bosses and sampler	.010	.009
Roustabouts	.001	.001
Laborers	.003	.001
Watchmen	.006	.006
Experimental labor	.....	.002
Repairmen	.....	.....
Belts	.001	.....
General machine parts	.....	.....
Oil and waste	.002	.001
Miscellaneous	.013	.002
Pulleys	.001	.....
Machine-shop repairs	.....	.....
Electrical repairs	.002	.003
Building repairs	.012	.007
Mill-shop repairs	.001	.001
Electric power	.....	.001
Water and water power	.....	.....
Electric light	.005	.005
Heating	.023	.014
Assaying	.009	.006
Train service	.002	.001
Contingent expense	.011	.007
Depreciation	.042	.031
Administrative expense	.017	.012
Taxes and insurfance	.028	.021
Free rent	.001	.001
Fire protection	.001	.002
Experimental supplies	.001	.001
South mill	.023	.008
Total	$0.229	$0.156

trators 1300 tons per day, or say 1336 tons per 24 hours of actual operation, at a cost of $286,070.

SCREENING

Details of Labor, Supplies, Etc.	Average per Ton for the Year	Last Year
Machinemen	$0.013	$0.009
Roustabouts	.001	.001
Repairmen	.....	.....
Screens	.003	.002
Belts	.....	.....
General machine parts	.....	.....
scellaneous	.007	.....
Pulleys	.001	..
Liners	.....	.....
Trommel screens	.007	.006
Building repairs	.005	.....
Mill-shop repairs	.004	.003
Electric power	.003	.004
Water and water power	.001	.001
Total	$0.045	$0.026

SHIPPING COST

The company shipped 75,963.96 tons concentrates, at the following cost:

	Per Ton	Last Year
Labor loading	$0.158	$0.182
Representatives at smelters	.031	.041
Supplies	.012	.006
Assaying	.016	.021
Heating	.011	.008
Sampling	.001	.....
Contingent expense	.006	.007
Administrative expense	.012	.012
Repairs	.004	.011
Total	$0.251	$20.88

ECONOMIC MILLING DATA

Days ran	356.10
Tons milled	475,784
Assay feed, % lead	9.7295
Assay feed, oz. silver	4.015
Contents feed, tons lead	46,291,310
Tons concentrates	76,284.12
Average assay concentrates, % lead	50.6651
Average assay concentrates, oz. silver	18.4345
Contents concentrates, tons lead	38,649.44
Extraction lead, %	83.49
Contents feed, oz. silver	1,910,281.14
Contents concentrates, oz. silver	1,406,259.97
Extraction silver, %	73.62
Value feed	$7,636,349.89
Value concentrates	$3,297,827.25
Economic extraction, %	43.18
Tons milled per 24 hours	1,336.09
Tons concentrates produced per 24 hours	214,221
Tons lead produced per 24 hours	108,535
Cost per ton milled	$0.598
Cost per ton concentrate	$3.397

The cost of screening and shipping are given, together with important milling data.

The foregoing detailed charges for concentration have been subdivided under the following headings: Crushing and Conveying, Screening, Jigging, Grinding, Concentrating and General Mill Expense.

Anaconda Accident Record

In the May issue of the *Anode*, the official organ published by the general safety committee of the Anaconda Copper Mining Co., is given a report for the year ended Mar. 31, 1917, of all accidents occurring in each of the company's mines.

The first prize, of $750, was won by H. Tonkin, foreman of the Poulin mine, and the second prize, $250, by T. J. Chope, foreman of the High Ore-Modoc mine. The High Ore-Modoc worked 269,286 man-shifts, this being considerably more than any other, and is charged with 14 accidents during the year, or 0.357 per 10,000 shifts.

T. H. Oaas, safety engineer of the general committee, has just completed a report for the first quarter of 1917, showing the following results, figures being based on one accident per 10,000 shifts: Fatal, 0.11; serious, 0.69; slight, 14.54; total, 15.34. This compares with the previous year, 1916, as follows: Fatal, 0.12; serious, 0.79; slight, 14.99; total, 15.90.

A substantial reduction in all classes of accidents from the average of the previous year is thus recorded for the first three months of 1917.

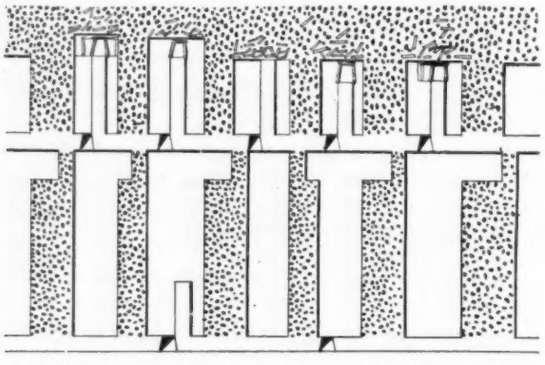
Details of Practical Mining

Room and Pillar Mining at Loretto, Mich.*

The main orebody at the Loretto mine, Michigan, is a vein-like deposit dipping almost vertically and averaging about 1000 ft. in length. Its average width is from 10 to 40 ft., but in places it narrows to a few feet or widens out to 100 ft. For the greater part of its length the ore came up to the overburden, which is about 25 ft. in depth. The orebody is developed to a depth of 800 feet.

The ore varies greatly both in iron content and in physical characteristics. In some sections it is lean and hard; in others, though of high iron content, it will stand up well; in others the ore is composed of uncemented grains, and though easily handled when dry, is almost impossible to hold when wet. The orebody is for the most part dry, but in places water comes in from the wall rocks and causes trouble in mining.

Both foot and hanging walls are weak slate-like formations with a marked cleavage with the bedding, and

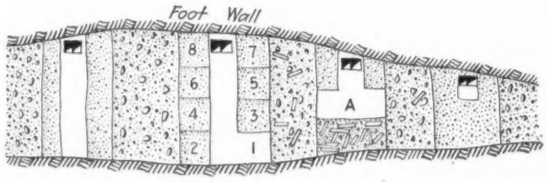


LONGITUDINAL SECTION IN ROOM-AND-PILLAR METHOD USED AT LORETTO

joints across the bedding. The wall rock breaks off first into slabs and then into small angular pieces along the joint planes.

When this orebody was first opened, the Sturgeon River crossed it at about the middle of its length, making necessary the supporting of the surface. The room-and-pillar method of mining was used at first, the distance between levels being 100 ft. On each level a crosscut was driven from the shaft in the foot wall to the orebody, and a drift run longitudinally in the orebody and supported with square-set timbers. Except under the river, where a large pillar of ore was left, alternate stopes and pillars were laid out; the stopes were usually two or three sets and the pillars three or four sets wide and extended from foot to hanging wall. The stopes were mined by the usual square-set method to within 20 ft. of the level above. By this method the larger portion of the ore was left in the mine to support the surface.

In 1908 the river was diverted around the orebody and the removal of the pillars by the top-slicing method commenced. All the stopes in the mine that were open were filled with rock. On each level as mining proceeds a drift is driven in the foot wall parallel to the orebody and a crosscut into each pillar. A two-compartment raise, 4 x 7 ft. in outside dimensions and built of 6-in. cribbing, is put up in each pillar, preferably on the foot wall. Mining then proceeds from the top by the usual top-slicing method. Nine slices are taken



PLAN OF PILLAR, SHOWING ORDER OF SLICING BACK

to a level, each slice thus being about 11 ft. high. In slicing, the ordinary type of drift set is used, with a post 9 ft. long and a cap 4 to 6 ft. inside the joggle to suit conditions. The timbers are from 6 to 10 in. diameter. The usual slice is 9 ft. wide.

The usual procedure from the top of the raise is to crosscut to the hanging wall, drift east and west to the filled stopes, then drop back toward the foot wall by successive side slices until the floor is all removed. The ore is shoveled into ¾-ton buggies and dumped in the raises. As the ore is taken out, the bottom is covered with 1-in. hardwood boards or lagging, and whenever the timber from that portion of the slice from which the ore has been removed shows much weight, it is blasted and the back brought down. Before the sets around the raise are blasted, the slice below is opened up enough to make room for the buggy and tools. As the work advances, the ore on each slice is taken out up to the floor of the slice above; so that no ore is left to be pulled coming back.

Many variations of the method are practiced, always in accordance with the general rule that the ground around the raise is weakened as little as possible and that the mining is retreating toward the raise. As the pillars vary greatly in size, often more than one raise must be put in a pillar to keep it from lagging behind the others; in this manner the mining is kept at about the same height in all the pillars. Since many of the pillars are small, the amount of ore mined from each raise is much less than would be the case with a new orebody.

On the upper levels, the mat of timber above the back followed the mining down pretty well, and in most cases only a little lagging was needed to cover the bottom of the slice. At present, however, the pressure from the walls seems to hold the mat up and the open-

*Paper presented by C. H. Baxter, superintendent, Loretto Mine, Loretto, Mich., at the annual meeting of the Lake Superior Mining Institute, Birmingham, Ala., Mar. 13-16, 1917.

ing left by mining fills with wall rock. If any opening is left in the back, fine rock will run until stopped; this necessitates lagging each floor very closely.

The amount of dead work in driving drifts and crosscuts in the foot wall is great for the amount of ore mined; but this cannot be avoided as the settling of the pillars makes it impossible to hold an opening in the orebody for more than a short time. This settling even affects the foot wall, so that in places the crosscuts to the orebody must be regraded and retimbered several times a year. The settling of the pillars and old filled stopes in mass has amounted to from 20 to 30 ft. for a considerable length of the orebody. The pillars have now been extracted down to about the fifth level; as all of ground is opened up and timbered, the extraction is practically 100%.

A Time Saver for Surveyors

By Enoch Perkins
Mine surveyor, Alaska Gold Mines Co., Juneau, Alaska.

The following description of a device for holding the candle and tracing cloth when taking backsights in underground surveying may be of value to some of your readers. This device has the following advantages over the other types with which I am familiar:

The over-all length (18 in.) is such that in almost any drift, the sight is sufficiently high above the rail to enable cars to clear without disturbing it. If the

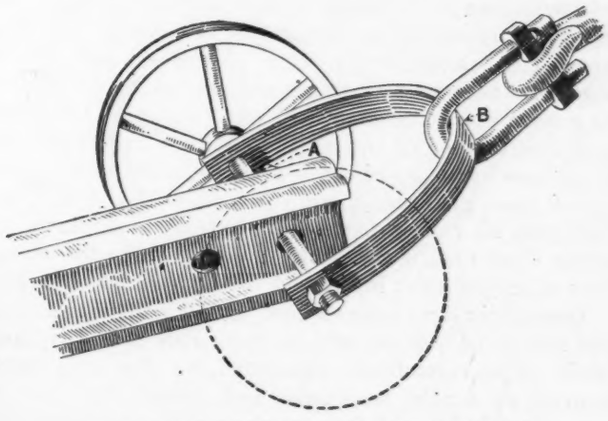
BACKSIGHT DEVICE HELD HORIZONTALLY IN POST

station is in a plug in the back of the drift, the pointed end may be thrust into the plug behind the spad, or should the back be low between the transit and the backsight, the point may be stuck in the floor of the drift. In timbered drifts or raises it is often an advantage to set it horizontally, as in the photograph. In this the construction shown differs slightly from the drawing.

Ordinary tracing cloth is used to diffuse the light from the candle, and it is surprising the distance at which this backsight is plainly visible and easily "picked up" without any other illumination of the crosshairs. In carrying lines up raises, two of these devices are often used, one for the foresight and one for the backsight, thus leaving the assistant free to aid the instrumentman at the transit in setting up, recording angles, etc. It is light and simple of construction and can be made by any ordinary blacksmith in thirty minutes, the only requirement being ¼-in. round iron.

Method of Packing Rails

The ordinary method of packing rails on muleback, namely, that of fastening the upper ends of three or four rails on each side of the pack saddle and allowing the other ends to drag, will not work on narrow and steep mountain trails, because the dragging ends have a tendency to spread out like a fan. This results in the rails on one side falling off the trail, probably being suspended in space, if the trail is around the face of a cliff, while the rails on the other side interfere with



A METHOD OF RAIL TRANSPORTATION

the bank. In order to overcome this difficulty, the clevis shown in the accompanying illustration was used with success. This was made of ¼ x 1½-in. iron and with an 8-in. span (any similar dimensions will do). To transport the rails, the rod *A* is passed through the bolt holes of several rails laid close together. A chain is then passed through the clevis at *B*, and fastened to the mule. The load of rails may then be dragged over as rough and narrow a trail as the mule can travel. If the trail is not too rough, the weight of the rail may be taken up, and consequently more of them transported at a time, by using a slightly longer rod and a small iron wheel on either side of the clevis. Wheels from old wheelbarrows are just the right size for this work and will stand a great deal of hard usage. Other heavy material, such as large timbers, may also be dragged successfully with this two-wheel arrangement.

New Drill Steel Used during 1916 by the Old Dominion Copper Mining and Smelting Co., Globe, Ariz., according to the "Old Dominion Bulletin" for March, 1917, consisted of 1.5 tons Bull Moose, 8 tons stoper, 2.5 tons plugger and 3.5 tons Leyner. One man sharpens and one man tempers all steel, averaging 455 pieces per day each during 1916. One man also sharpens and tempers all picks, averaging 20 per hour. One man grinds on an average of 16 axes and files 12 saws per day.

Correspondence and Discussion

Strike Conditions in Arizona

The amount of copper produced in the Clifton-Morenci district at the time of the calling of the present strike was approximately at the rate of 100,000,000 lb. per year, divided as follows: The Arizona Copper Co., Ltd., 5,000,000 lb. per month; Phelps-Dodge Corporation, Morenci Branch, 2,000,000 lb. and the Shannon Copper Co., 1,000,000 lb. per month. As many of your readers are aware, this district was the scene of a prolonged strike lasting from the middle of September, 1915, until the end of January, 1916, and shortly after the resumption of operations in February of last year the managers of the three operating companies met in conference with a committee elected from their employees and jointly drafted a new scale of wages and a working agreement to govern operating conditions and to provide for a full and free method of intercourse between employers and employees by means of conferences or, as the men prefer to call them, grievance committees, whose duty it is to investigate all causes for dissatisfaction, to endeavor to settle them and, if necessary, bring them to the attention of department heads and to the general manager.

Operations have been carried on under this agreement for nearly 18 months, and on the whole it has worked well. The committees appointed by the men have proved, as a rule, reasonable and conservative and it can certainly be said that grievances of every kind and description, from the most insignificant to those of importance have been brought to the attention of the committees and have been handled by them.

The rank and file of our employees are of Mexican, Spanish and Italian origin, and since the strike of 1915 have been strongly unionized. Their idea of unionism is that they must have everything their own way. It has been a difficult matter to educate them to the idea that the agreement obligates them just as well as the companies.

The principal advantage found in the working out of the agreement has been that no opportunity for hidden grievances inflaming employees can exist without the knowledge of the managers. That the agreement has effected what it was drawn for, namely, the minimizing of troubles involving strikes, is not the case. During the comparatively short period that the agreement has been in effect, the three companies operating in this district have had more strikes than during the 20 years preceding.

Since the settlement of the 1915 strike, when the companies agreed to reinstate almost without reservation all of its striking employees, the idea has prevailed among the foreign employees that they have been guaranteed their jobs in perpetuity, consequently when one of their number has been discharged for any cause, such action has in numerous cases been followed by a walkout on the part of his fellow employees in his department. These small strikes have been so numerous among the Mexicans that the term "strikitos" has become current in this district in referring to them, while several strikes involving a complete suspension of all departments, of periods from a few days to two weeks, have also occurred and usually over matters of insignificant importance to the employees generally although the principle made them all-important to the companies.

There is one case of a Mexican timberman who, until the time of the 1915 strike had been a good workman. Since his re-employment after the strike he showed a most refractory spirit and would not carry out instructions of his bosses and continually loafed.

Simon's ill temper was humored by his first boss, who took the first opportunity to have him transferred to another part of the mine. The second boss put up with him for awhile and succeeded in again passing him along to a third, and the latter to a fourth until Simon had been tried out in various parts of the mine under various bosses. Finally he was given a layoff of two weeks for flagrant breach of instructions.

He immediately took his case to the grievance committee which brought it to the attention of the superintendent who held an investigation and sustained the action of the shift boss, which decision was concurred in by the committee. The man threatened to prevent anyone from going to work in the mine unless he was immediately reinstated and paid for the time he had lost, which, of course, was denied. He made good his threat, and a strike involving the entire suspension of operation and loss of employment to about 2500 men for two weeks followed, during which time the Federal Labor Conciliator visited the district, investigated the facts, sustained the company's position and induced the men to return to work.

Another feature in the operation of the agreement has been the excessive and serious inroads into the time of the superintendents and other officials caused by the numerous investigations asked for by the grievance committees and which, under the agreement, cannot very well be delegated to others.

Conditions in the mines have become almost intolerable. I quote one of the mine superintendents, as follows: "The falling off in the efficiency of the labor since commencing operations in January, 1916, has been serious. Labor has assumed an attitude of independence amounting to arrogance which has made it exceedingly trying and exasperating to those in authority. Common operating orders are ignored or resented. Taunts of inability to dismiss are made by the men, with the veiled and sometimes open threat of consequences. Discipline is forgotten. Timbermen and shift bosses are intimidated if they attempt to give orders.

"Certain standards of work were adopted and adhered to, irrespective of conditions. Ten cars were adopted as a mucker's day's work. In one case, where the men shoveled directly into a chute, they actually installed a wholly unnecessary track and car which involved extra

labor for them, but permitted them to measure the standard day's work! Work was hampered in all directions by the absurd standards adopted by the men.

"A comparison between the results obtained in other districts with those obtained here show that the efficiency here is about two-thirds only of what is obtained in other camps with the same class of labor."

Such occurrences cannot reasonablye be laid to the charge of any of the old employees in this district, but probably to some of the I. W. W. floaters whose activities have so grown since the commencement of the war.

Notwithstanding the conciliatory attitude of the companies' managers in the handling of the labor situation, and despite the conservative attitude of the grievance committees in their desire to control the men they represent and the wisdom of their advice, talk of a general strike has been rife among the rank and file for several months past. Nothing definite could be ascertained regarding the cause for this talk, except that the Mexicans have been working long enough and they want a rest, and they openly stated that since the companies could close down their works at any time for repairs, or for any other reason, that they also had as much right to close them down when it suited *them.*

A strike, such as that of 1915, appeals to the average Mexican member of the union. The show of authority, the parade with bands, the beating up of non-sympathetic fellow employees, and tin-can parties for drumming their defenceless victims out of the town, all of which were carried on openly, provided an exciting entertainment for them.

This desire for a vacation fell in very well with the plans of the union leaders, who realize that peaceful times offer no inducement to the average Mexican to keep his dues paid up, hence all possible dissatisfaction has been created and fostered. Furthermore this situation fell in admirably with the plans of the labor representatives from outside the district who have brought about simultaneous strikes throughout nearly all the important camps of the West.

On May 29, the Federal Department of Labor took cognizance of the strike rumors in this district and sent a representative to investigate conditions, which he spent several days in doing. At his request a meeting of the managers with the district conference committee of employees was held which lasted two days, and all the matters in any way unsatisfactory to the employees, which were brought forward by the committee, were fully discussed and as far as possible cleared up, and the Federal representative expressed the opinion that working conditions were good and there existed no reason whatever for a strike. Nevertheless, on June 19, the district committee asked for a meeting with the managers at which time they presented them with a series of demands. The managers requested 10 days for consideration, which was granted and they subsequently received a later communication from the committee, stating that a formal answer would be required on the evening of June 30. In the meantime the managers, foreseeing trouble, communicated with the Department of Labor and requested the presence of Mr. Myers, labor conciliator for this district, who at that time was engaged on a case in the East. The request was granted, but could not be immediately complied with, Mr. Myers wiring the managers to request the men to avoid a strike until he could arrive. This request was presented to the committee and through them to the men, but was turned down and a formal answer as arranged was demanded.

The answer of the Arizona Copper Co. and the Shannon Copper Co. took the position that while conditions in this district do not justify an increase in wages, which are adjusted on a sliding scale according to the price of copper, nevertheless it was their patriotic duty to go as far as possible toward averting a strike and offered 50 and 25c. per day more, conditional on its acceptance by the employees without resort to strike.

The Phelps-Dodge Corporation, Morenci Branch, replied to the minor demands in a similar manner to the other companies, but on the subject of wages took the position that a strike, being already arranged as part of a general labor program, the offer of a wage concession at this time would not avert a strike, and simply declined the demand for the Miami scale. The offer of the two companies was not accepted, but in that action the responsibility for the strike cannot be laid to lack of effort on the part of those companies to avert it.

The committee received the companies' answers, reporting it to a meeting of the Central Labor Union in waiting, and they were rejected by that body and in spite of a protest by the employees' committee a strike order was immediately signed by J. L. Donnelly, president of the Arizona State Federation of Labor, to take effect at 10 o'clock the following morning.

It will be noted that the strike was called without submitting the companies' answers or compromise to the employees generally for their approval or rejection, and no strike vote of the employees was taken; in fact, it is doubtful if 1% of the employees knew anything of the contents of the manager's answers before striking.

The employees have demanded the Miami scale of wages. It is true that the Miami scale is higher than that paid in this district, but mining conditions here are totally different and operating costs are and will always be higher here than in the Miami district. Nevertheless the average wage paid to all employees of the largest company in this district for the first five months in 1917 was $4.28 per day, and that labor in this district gets fully as fair a proportion of the values produced as elsewhere the following comparison will show:

In the month of May, 1917, there were mined by the Inspiration and Miami companies a total of 777,220 tons of ore, or 25,071 tons per day. The total number of men employed in their mining departments by these two companies was 1875, or a yield of 13.4 tons per man day.

In the Clifton-Morenci-Metcalf district, the Arizona, Phelps-Dodge and Shannon companies together mine 6710 tons per day, and employ in their mining operations 3730 men, equivalent to a yield of 1.8 tons per man per day. Making further comparison on the basis of copper produced, the Inspiration and Miami Copper companies employed a total of 3748 men in all their mining, concentrating and smelting operations for the month of May, and produced a total of 17,187,592 lb. of copper, or a yield per man per day of 147 lb. The three companies operating in the Clifton-Morenci-Metcalf district in their total mining, concentrating and smelting operations employ 5197 men and produce 7,952,000 lb. of copper per month, equivalent to a yield of 51 lb. of copper per man per day.

NORMAN CARMICHAEL.

Clifton, Ariz., July 7, 1917.

McCartney's Hoist Indicator

A hoist indicator of the noncumulative type, is the invention of Alex McCartney, an employee of the Wemyss Coal Co., Ltd. One of these indicators, recently installed in the Wellsley Colliery, Fife, which embodies some distinctly original features, more particularly perhaps in regard to the method of indication of signals and the ingenious form of the time lag, a form which has enabled the inventor to do without a dashpot, is described by the *Iron and Coal Trades Review*, of London.

It will be seen that the main shaft carries two pointers, the longer—the main pointer—being immovably fixed thereon and the shorter mounted upon a loose sleeve, which is free to revolve around the main shaft. Twin ratchet wheels and drums are mounted respectively upon the main shaft and the loose sleeve, the drums carrying chains from which are suspended weights to keep the tension on the ratchet wheels. The ratchet wheel upon the main shaft is engaged by the lever *A* and pawl *B* actuated by the signal wire. The pawl working over a fixed sheath, secured to the back of the casing, clears the teeth when the lever is in the back position. The smaller pointer is furnished with a projecting pin which, when the main ratchet is advanced, is engaged by a corresponding slot in the side of the longer pointer and so moved forward step by step with this last. Spring-actuated retaining pawls *C* and *D* are placed upon the under side of the ratchet wheels.

A disk, equal in diameter to that of the dial of the apparatus, is secured to the cheek of the drum which is in front of the ratchet on the loose sleeve and immediately behind the dial. The dial itself is numbered from 1 to 11; the third position, however, is cut away, leaving a slot through which the disk on the drum is plainly seen. The third position on this disk is printed with the word "Men," the whole of the other divisions which correspond with the divisions of the indicator dial have the figure "3" printed therein, the effect being that, with the exception of the advisory signal, when as already stated the word "Men" appears, the figure "3" is always shown in the opening of the dial irrespective of the number of rings or the position of the pointers.

The method employed for effecting the automatic cancellation of the signals is distinctly ingenious, comprising a train of three gear wheels and a pinion. To the main wheel of the train is secured a second gear wheel arranged to "free wheel" when the direction of rotation is from left to right. A chain is carried over this wheel, with one end attached to the bottom end of the main actuating lever, and from the opposite end a weight is suspended. When the lever is pulled forward to transmit a signal, the weight is raised, the free wheel only moving, and immediately the lever is released, the weight begins to descend slowly, as its speed is now controlled by the train of gears, until it engages the tramplever which works on a short shaft bolted to the back of the case and under the back plate toward the right-hand side. The tramplever is pliably connected to the retaining pawl *C* of the main ratchet, so that when the lever is depressed by the weight, it pulls the retaining pawl clear and allows the pointer to be returned to the zero position by the weight-actuated drum already mentioned. The retaining pawl for the ratchet controlling the short pointer is freed from engagement through the connecting-rod *E* from the winding engine. Provision, however, is made for restoring this pointer to zero by means of a short lever *F*, which is fitted to the shaft and has a pawl *G* working loose on the side next the front wheel, the end of which pawl engages a pin projecting from the ratchet-retaining pawl and pushes it out when the first signal is given, the loose pawl dropping into position when the large pointer is returned to zero. It may be added that by hanging up the pawl *G*, in the case of any signal then being given, it would stand until the engine being started released it; for

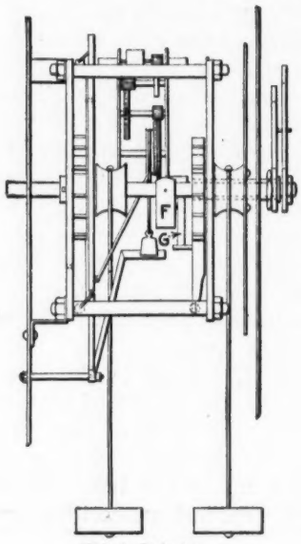


FIG. 1-Side View

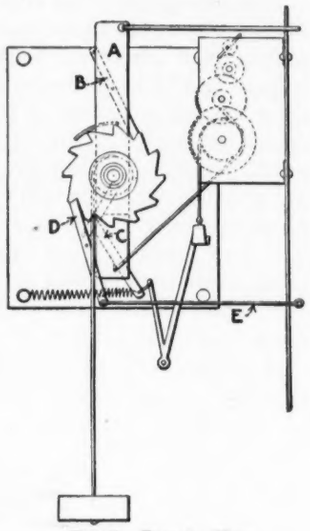


FIG. 2- Front View (Dial & Casing Removed)

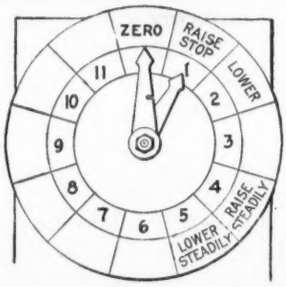
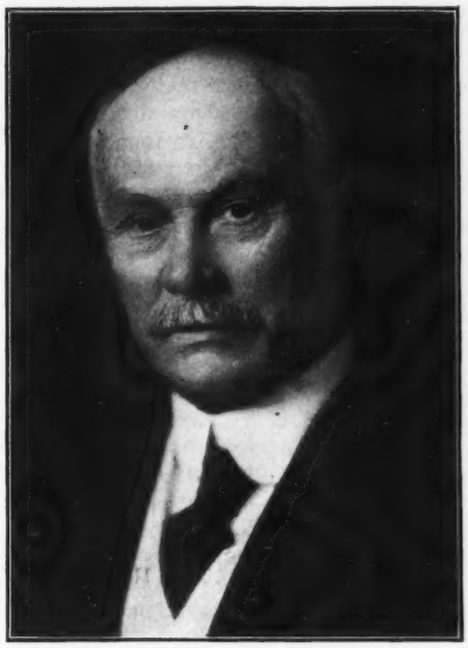


DIAGRAM OF McCARTNEY'S VISUAL INDICATOR

example, if the pawl was hung up and 3 signaled, both pointers would move to 3; then, after a few seconds, the large pointer would return to zero, leaving the smaller pointer standing until released by the engine in motion. What the inventor intended by this method was that, in the event of the engineman being out of the engine room, any signal given in his absence would stand and so prevent any possibility of an accident with men on the cage, as it is the banksman now who gives the back signal instead of the engineman as formerly.

From the foregoing it will be understood that when the signaling wire is pulled, the pointers move round together, step by step, for a number of places, according to the nature of the signal, the train of gears acting as a time lag. So soon, however, as the signal is complete and the time limit has been exhausted, the main pointer is returned to the zero position automatically, while the short pointer remains stationary at the last signal transmitted and is not released until the engine has been put over, though, when necessary, it may be released by hand in the manner already mentioned.

Chairmen of Subcommittees on Raw Materials Appointed by Advisory Commission to Council of National Defense



ELBERT H. GARY
Chairman of the Steel Committee

CLINTON H CRANE
Chairman of the Lead Committee

WILLIAM H. NICHOLS
Chairman of the Chemicals Committee

ARTHUR V. DAVIS
Chairman of the Aluminum Committee

Events and Economics of the War

Germany is beset with troubles. The Chancellor is out and the Reichstag talks peace in a way before unheard. In the meantime the Russians press on in Galicia. Other fronts are quiet except for occasional raids.

Several important events have quietly taken place in the United States. The export embargo has become effective. The National Guard has been mobilized in 11 states. The draft quotas have been published. The determination of cost of production has been referred to the Federal Trade Commission.

The Food Bill is traveling a stormy course and the shipping row appears without solution unless someone resigns. The work of suppressing agitators has begun and the internment of Teuton agents continues.

Hoover on Perils of Delay

The experience this year in rampant speculation, extortionate profits, and the prospect of even narrower supplies than the 1916 harvest and carry over, says Herbert Hoover, must cause the deepest anxiety. It is evident that the unbearable increase in the margin between producer and consumer is due to not only rank speculation, but more largely to the wide margin of profit demanded by every link in the chain to insure them from the great hazards of trade in the widely fluctuating and dangerous price situation.

During recent months the allied governments have consolidated their buying into one hand, and as the restricted exports to neutrals are but a minor item, the export price, if not controlled, is subject to the will of the allied buyer. Furthermore, in normal circumstances United States and Canadian wheat is moved to Europe largely in the fall months. This year, owing to the shortage of shipping, the allied supplies must proceed over a large period of the year. We must, therefore, expect a glut in our interior terminals during a considerable period. The financial resources of the grain trade are probably insufficient to carry this extra load without the help of speculators. The net result is that unless some strong and efficient government action is immediately settled upon and brought into play the American producer will face a slump in wheat, the price of export wheat will be dictated by a single agency, and a large part of the essential breadstuffs will have passed into the hands of speculators.

Three facts stand out from our investigations: First, the farmer will need protection as to the price of wheat; second, large masses of people in the consuming centers are being actually undernourished today, due to the exorbitant cost of living; and these conditions, unless some remedy be found, are likely to repeat themselves in even more vicious form at this time next year; third, the speculator, legitimate or vicious, has taken a large part of the money now being paid by the consumer.

It seems to be overlooked in some quarters that the marketing of this year's wheat is surrounded with circumstances new to history and that the old distributing safeguards are torn away by isolation from the reciprocal markets abroad and the extinction of a free export market and transportation. The harvest has begun to move and the price of wheat to drop; and if the farmer is to sell his wheat either the speculator must buy and carry not only the normal flow from the farmer in excess of domestic and foreign requirements, but also the glut due to the restriction upon the outlet to the latter. He must necessarily charge his toll to the producer and the consumer, and this latter probably upon a more extensive scale than last year, as his risks will be greater. Or the government must buy the surplus wheat at some reasonable minimum price, allowing the normal domestic trade of the country to proceed with proper safeguards against speculation. The government should be able to stabilize the price of wheat without the speculator's assistance and can control the price and quantity of export wheat. We are practically helpless to safeguard either the farmer or the consumer until the pending legislation is passed.

The Government Nitrate Plant

The board of army engineers that has been investigating the availability of 270 sites for the government nitrate plant has recommended that it be located at one of the following 11 points, preference being in the order given: 1. Black Warrior river in Alabama; 2. Muscle Shoals in Alabama; 3. Near Knoxville on the Holston river; 4. New River in southwest Virginia; 5. Ohio river at Louisville; 6. Chattahoochie river in Alabama and Georgia; 7. At Cartersville, Ga.; 8. At Rome, Ga.; 9. Columbia, S. C., on Congaree river; 10. At Augusta, Ga., on Savannah river; 11. Complete steam plant for nitrate at Wheeling, W. Va.

The conclusions set out in the report are that at present no permanent plant be located and that experiments in the cyanide and synthetic processes should be conducted and that all the circumstances pointed to New River, Va., and the Upper Holston near Knoxville as places for such experiments.

It is recommended that $4,000,000 should be set aside of the available appropriation of $20,000,000 for such experiments and that the decision on the permanent location should await findings as to experiments on cost and processes. The report sets out that the center of nitrate consumption is in the southwest corner of North Carolina.

There are four methods for making nitrate, says the report, namely, electric arc system, cyanamid, cyanide and the synthetic ammonia process. It can be produced as a by-product from coke ovens.

The arc system was found objectionable as requiring immense water power and waste. Cyanamid requires considerable water power and the cost of the method is high. The cyanide process requires little power, the same being true of the synthetic ammonia process.

The cyanamid and synthetic ammonia processes are practically in the experimental stages, but have great promise and while success is assured further experiments should be made on a large scale.

Factors that entered into the selection of the locations related to proximity to center of demand of the products, the water power and expense involved in developing it, the convenience to raw material such as coal, coke and lime, also to labor and climatic conditions.

Work of the Labor Committee

Perhaps the most outstanding achievement of the Committee on Labor of the Council of National Defense has been the following resolution adopted at the meeting of its executive committee and approved by the Council and its Advisory Commission.

The defense and safety of the nation must be the first consideration of all patriotic citizens. To avoid confusion and facilitate the preparation for national defense and give a stable basis upon which the representatives of the Government may operate during the war, we recommend:

That the Council of National Defense should issue a statement to employers and employees in our industrial plants and transportation systems advising that neither employers nor employees shall endeavor to take advantage of the country's necessities to change existing standards (that is, those constituting a day's work and wages). When economic or other emergencies arise requiring changes of standards, the same should be made only after such proposed changes have been investigated and approved by the Council of National Defense.

That the Council of National Defense urge upon the legislatures of the states, as well as all administrative agencies charged with the enforcement of labor and health laws, the great duty of rigorously maintaining the existing safeguards as to the health and the welfare of workers, and that no departure from such present standards in state laws or state rulings affecting labor, should be taken without a declaration of the Council of National Defense that such a departure is essential for the effective pursuit of the national defense.

That the Council of National Defense urges upon the legislatures of the several states that before final adjournment they delegate to the governors of their respective states the power to suspend or modify restrictions contained in their labor laws when such suspension or modification shall be requested by the Council of National Defense; and such suspensions or modifications, when made shall continue for a specified period and not longer than the duration of the war.

Zeppelin motor busses are being run between London and Eastbourne. Owing to shortage of petrol a single deck motor bus is equipped with a long gas bag on top filled with coal gas to be used as a substitute for petrol for driving power.

The Government has completed tentative plans to send 1000 aviators a month to France, and the first big overseas force of airmen will be ready to embark some time in September. American manufacturers have promised to supply all training planes needed by this country and its allies.

German Torpedoes Inferior

There is reason to believe that the German torpedo supply is weakening, says a statement issued at the Navy League headquarters on July 15. The increasing frequency with which press dispatches report merchant ships as successfully dodging torpedoes, suggests to the technically trained mind that the German torpedo is deteriorating in speed and hence in accuracy of fire at long range.

The explanation of this offered by certain naval experts is that the Germans are so pressed for time in the construction of torpedoes that they can no longer maintain their speed and their accuracy of fire. It is estimated that their torpedo has lost nearly 10 knots in speed from the standard used at the outset of the war.

It takes normally six months to construct a torpedo and costs many thousand dollars. There is also a chance of Germany running short of some material essential to their manufacture. Whether this has occurred is not known, but the conclusion has been reached that the individual German torpedo is losing in efficiency.

The U-boat warfare as now being waged, it is said, was undoubtedly not thought out and prepared for by Germany before the war. Therefore the stock of torpedoes was not sufficient for the purpose. The deficiency has been made up by increasing the output of torpedoes. But with the tremendous land operations she has essayed, Germany could not have devoted a maximum of labor or materials to the making of torpedoes.

Moratoria in the United States

Some weeks ago, says the *Boston News Bureau*, there was passed a "moratorium" act in Oregon, which is understood to be similar in general terms to statutes previously existing in some other states. The Oregon act reads:

> No suit or action shall be commenced or maintained, during the period hereinafter provided for, to foreclose any mortgage upon real property, or to collect the debt secured thereby, if the land covered by the mortgage be owned, wholly or in part, by an enlisted man in the army or navy of the United States, who shall have enlisted therein in the volunteer forces or who shall have been enlisted in the National Guard of the United States and of the State of Oregon and his organization called into the service of the United States; and the lands of any such soldier or sailor shall be exempt from judicial sale for the satisfaction of any judgment during the period hereinafter provided for; provided, that this moratorium shall extend only during the period of actual service in the army or navy forces of the United States, and in no case shall begin prior to the day on which the Congress of the United States shall declare war, nor continue after 60 days subsequent to the conclusion of such war; provided, that all statutes of limitation in effect in the State of Oregon shall be suspended during the period above described, as to the mortgages, debts and judgments in this act described.

The most that such a law authorizes is postponement of interest payments for the duration of a man's military service; but the possibility of a lapse of interest for an indefinite period is not usually attractive to investors.

A joint resolution providing that the war army shall be officially known as the National Army of the United States was introduced. That is the name in use by the War Department officials now.

State Committees for Research

The National Research Council has recently considered the matter of the formation of research committees in the various states. In a letter sent to the several state councils of defense it says, "Such organizations should be determined by local needs and conditions. Local causes, such as the development or investigation of natural resources or the correlation of industries with research laboratories already existing at educational institutions, or the proper development of the use of research methods in industries may make it very desirable to organize such state research committees."

"In fact, the present emergency offers, in some respects, an unusual opportunity for improving the correlation of industry and research and it is highly desirable that those concerned should also plan for the permanent continuance of any research committee that may be formed."

"Such committees should be organized under the councils of defense of their states and should be representative of the universities and other leading educational and research institutions and also of those industries in which applied science plays the most important part."

America Must Provide Food

The Allies and the European neutrals will require a total of 971,000,000 bushels of bread and fodder grains out of the next harvest, and, in addition to that great amount, provision must be made for the grain ships destroyed by submarines, says Mr. Hoover.

Mr. Hoover presented the situation in detail for the first time, the figures representing the result of his researches while in Europe. He admitted that it would be impossible for North America to furnish all grain needed and provide for itself, but he added that the country must shoulder the major part of the burden.

Coincident with his decision to acquaint the country with all the facts in the situation, Mr. Hoover said that the task of conserving and apportioning America's grain supply would be undertaken as soon as powers were granted by Congress. Representatives of the Allies, he said, who were entering into forward contracts pending the adoption of this legislation were doing so at their own risk. As soon as the food administration was in full operation, he said, the situation would be canvassed, and, if necessary, many purchases by other countries would be canceled to serve the common cause.

Nationalization of the Railroads

For the troop movements which have already taken place and for those to come the 639 railroad companies of the United States and the lines they control have been completely nationalized, says President Willard of the Baltimore and Ohio Railroad and chairman of the committee on transportation of the Council of National Defense.

If it becomes necessary the 263,000 miles of road in America can be operated as one system. The coördination of efforts has resulted in a tremendous increase in the supply of coal cars, facilitated the transit of grain and met the needs of the Government in every respect. This has been accomplished notwithstanding the fact that in the last two months the railroads have been handling vastly more ton miles than ever before and have constantly been transporting many troops.

Huge Army Appropriations

Here are some illustrative figures, given by the *Official Bulletin*, showing the scale of Army operations at the present time:

In 1915, $450,000 was appropriated for aeronautics; this year, $47,000,000. In 1915, $9,800,000 for sustenance; this year, $133,000,000. In 1915, $10,000,000 for regular supplies; this year, almost $110,000,000. In 1915, $13,000,000 for transportation; this year, almost $222,000,000. In 1915, $6,500,000 for clothing and camp garrison equipage; this year, $231,500,000. In 1915, $300,000 for ordnance service; this year, $2,650,000. In 1915, $450,000 for manufacture of arms; this year, over $55,000,000. In 1915, $700,000 for ordnance stores and supplies; this year, $106,500,000.

Excused from Assessment Work

The Senate recently passed the Shafroth bill providing for suspension, during the war, of the requirement that not less than $100 worth of labor be performed or improvements made on each mining claim during each year for all owners who, in lieu of such assessment work, expend $100 in raising or manufacturing products necessary for the maintenance of the army, navy, or people of the United States or shall perform 25 days of labor in any beneficial occupation or pay into the treasury of the United States $100. The bill had the unanimous endorsement of the committee on Mines and Mining.

Dover—Calais Tunnel

Reports of the meeting of the Channel Tunnel Co. on June 8, indicate that the British Government is about to decide whether or not the tube connecting Great Britain and France shall be built. There have been repeated rumors recently that the decision would be favorable.

At the meting Baron Derlanger declared that some move must be made soon one way or the other, for railways preparing to rebuild the portions of their line on the Channel coast must know where the tunnel would begin on the English side.

Officers for the Merchant Fleet

The United States Shipping Board has made plans in coöperation with the Department of Commerce to obtain the large number of officers to operate the great fleet of merchant ships to be provided for the war emergency. The headquarters of the recruiting campaign will be at the Boston custom house. It is estimated that 10,000 officers will be needed for the German ships taken over and for those under construction.

A Washington dispatch to the *Boston News Bureau* says that the grounds on which exemptions will be granted in the first draft for 625,000 men are: Physical incapacity; employment in vital war industries; religious beliefs opposed to war; sole support of families.

Editorials

The Matter of Prices

LAST week, in discussing the controversy about prices, we forecasted the appeal to Cæsar, but even, before our issue was off the press Cæsar had spoken, his words being that prices are to be the same to the Government, to our allies and to everyone. Yet, in his words there is something of the character of those of the Delphic oracle. They are capable of more than one understanding. Some people infer that prices are to be drastically reduced, while other understand that they are to be high enough to afford a liberal profit.

On the one hand, Mr. Daniels and Mr. Baker appear satisfied, while on the other hand many discerning men of business interpret the President's pronouncement as being favorable to business. They read him as saying that the Government must pay a just price, such a price as will maintain industry in a high state of prosperity, enable it to pay good wages and yield the maximum production that is needed.

President Wilson's address was written in a strain of patriotic exaltation. In his appeal to producers to forego ideas of large profits, when he argues that while some must give their services and their lives in the field, others must give of their resources, he takes ground that is strong both logically and sentimentally, but this is just the ground that patriotic business men of the country themselves have been taking. They have cheerfully faced requirements for tremendous taxation, they have cheerfully subscribed to the Liberty Loan and to Red Cross funds. But in order to do those things, business must have the means.

In all due humility and deference to the Presidential opinion and pronouncement, we are bound to say that the feelings of sentiment therein are stronger than the appreciation of economics. There is left at issue the disputable question of what is a just price and whether it shall be determined by the operation of natural law as old as humanity, or whether it shall be determined by Governmental ukase. If the latter be attempted, there are two inevitable corrollaries. On the one hand, the Government must be prepared to say what shall be the consumption. On the other hand, it must be prepared to finance production that is deficient. Nothing has yet been said about the American Government doing either of those things.

The Labor Difficulties

THE last week has been a dramatic one in the labor disturbances that had their foci especially among the copper-mining districts of the West. Montana has been relatively quiet. Arizona has been the scene of unusual and violent events.

In Jerome, Bisbee and other districts, but especially in Bisbee, the people rose in righteous indignation and ejected some twelve hundred members of the I. W. W. They were loaded on railway trains and dispatched for wherever they could find an abiding place, but nobody in Arizona seemed to want to receive them, and finally they had to be taken under the protection of the United States Government, lest they should starve to death.

The President himself issued a warning to people in Arizona against lawless actions, ignorant, perhaps, that he had been responsible for bringing them to a head through his unfortunate and preposterous appointment of ex-Governor Hunt as a Federal mediator. That appointment was naturally taken by the labor leaders as license to do what they wanted, with the assurance that they would have quasi governmental support. People then rose in their indignation. It is distressing that there should be such recurrences of bad appointments by the President, who, previous to the war, had a failing for selecting the wrong men.

When the labor troubles broke out at Butte, it was supposed that they were inspired by I. W. W. agitators, with German backing, for certainly labor at Butte had no just grievance against the managements of the companies operating there. However, it was supposed that the outbreak was local, but as time wore on it appeared that there was a general plot to create trouble and check copper production all over the country, while incidentally there have been sporadic attempts to interfere with the production of iron ore, lumber, wheat and other things. Events have shown that this whole business is something requiring the strong hand of the Government for control and the maintenance of the production of supplies that are needed.

The Draft

WITHIN a few days the machinery for drafting men between the ages of 21 and 30 will be in operation. In preparing for it, the exemption of many men, either for reasons of physical incapacity or for better service to the country in other ways, has been contemplated. Unfortunately, however, the regulations of the War Department put something of a cloud over the way whereby exemption is to be claimed. On the face of things it might appear as if the person desiring to be exempted must claim it, and it has been argued that some men who ought to be exempted might not claim it for fear of a stigma upon their reputations. There will be no stigma whatever when a man physically fit is exempted for the reason that he can serve the country better in the mines, in the fields or in the factories than he can in the trenches. Moreover, it is pointed out that the exemption for such persons need not be claimed by themselves, but may be claimed for them.

In this connection we desire emphatically to call attention to the needs of the mineral industry in contributing assistance in the prosecution of the war. The question has arisen as to whether the employers of mining engineers, mining geologists and miners—also of metallurgists, millmen and smelters—in this country are fully alive to the necessity of considering carefully whether or not any man in their employ who is drafted can best serve with the colors or at home in his vocational capacity. For men whose places cannot be filled without many years of preparatory work to leave such work for service in the ranks or as junior officers and become widely distributed without adequate means for recalling them—a misfortune that has been experienced by all the warring countries of Europe—would certainly be unwise in all cases where the industry abandoned by such men is essential to the prosecution of the war. President Wilson himself has pointed out that it is quite as necessary for the men best qualified to produce to remain at home as it is for the men best qualified to fight to go to the front.

This question is one that is distinctly up to the employers. They must assume that many young men who ought to be retained at industry will allow themselves to be drafted rather than to claim exemption. Their employers must claim exemption for them and must be alive and right "on the job" in doing it. It may be well for the employers in any industry in each district to get together to talk things over, decide what are the conditions prevailing as to men needed in their industry and, if it be decided that nobody can be spared, make proper and prompt representations to the district exemption boards. The machinery for this purpose has been provided, and employers must not go to sleep at the switch that has been left in their charge.

The Matter of Aluminum

IT was only to be expected that some senator would jump on the Aluminum Company of America and its president, Mr. Davis. The position of this company is peculiar. It has a practical monopoly of the aluminum business, being the only producer on this Continent. It holds that monopoly and has made a great deal of money out of it by virtue of its patents in the first place and of its knowledge of the business in the second place. If Senator Reed, in his virtuous indignation, could tomorrow exterminate Mr. Davis and all his staff, the United States would have no aluminum, for there is nobody else who knows how to make it.

Copper metallurgists, steel metallurgists, lead metallurgists are common. The literature of their arts is profuse. But who ever heard of an aluminum metallurgist outside of those who hide their lights under Mr. Davis' bushel, and who ever read any contributions to technical literature on the metallurgy of aluminum? Moreover, the inertia of the aluminum industry is greater than in any other of the major metallurgical industries. This is to say that if we had the metallurgists and if we had the immense capital that is necessary, it would be a long time before we could begin to produce aluminum. All of this is merely to make clear the peculiar situation of the aluminum producer with respect to the Government.

Similarly, the aluminum producer has maintained a peculiar position with respect to the market. The bulk of its product is sold on long-running contracts, and the price that it has made for them ever since the war began has been materially below the casual market price. The latter has been established by dealings in imported aluminum (which of course ceased with the war) and by dealings in remelted scrap. The Aluminum Company of America has participated in that market; that is, the buyer who went to it for a few tons of the metal was asked and paid the price fluctuating from day to day. There have therefore been two prices for aluminum, the open market price and the contract price, the bulk of the production being sold at the latter.

In its contract price the Aluminum Company of America has exhibited great moderation. In 1915 the open market price was from 19c. at the beginning of the year to 60c. toward the end, while the contract price ranged from 20c. to 31c. In 1916 the open market price averaged 60.7c., having been as high as 65c. during two months, but early in the year the producer sold nearly all of its output at 31@37c. During 1917 the open market price for aluminum has been around 60c. This will, we hope, explain the following interesting report from Washington:

> While the policy of Secretary Daniels to get bargain prices was being discussed today, his attention was called to the charge of a senator that Arthur V. Davis, head of the Aluminum Company of America, was providing the Navy Department with aluminum and was also on the committee of the Council of National Defense, which regulated the price. The price agreed on was 27½c. per lb. for 143,100 pounds.
>
> Secretary Daniels indicated this was exorbitant and asked to know what was the last price he had paid for aluminum. By consulting the record he found that the market price was 60c. "I don't want the market price; I want the price I paid," he said to the officer who had brought the records.
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> "Sixty-three cents a pound," was the reply, whereupon Secretary Daniels announced that he would at once make an effort to get at the cost of aluminum production. He admitted, however, that the price of 27½c. agreed upon by the Council of National Defense was a bargain compared to 63 cents.

We do not know to what extent the cost of producing aluminum has increased during the last two years, but we fancy it has increased materially along with other things. We do know, however, that for many years before the war the price for aluminum hung steadily around 20c. per lb. When, therefore, Mr. Davis made a price of 27½c. to the Government, he was not engaging in any unpatriotic profiteering, nor does it look as if his position as chairman of the aluminum committee influenced him in any way other than to be generous.

Congress and Cotton

WHY is it that Congress is so eager to throw monkey wrenches into the gears of the copper, steel and other industries, but becomes furious when there is a proposal to extend the same legislation to cotton?

Why is that Mr. Daniels and Mr. Baker spend so much time in negotiating with the (in their eyes) nefarious

coal producers and give no thought to the cotton planters?

Is it a fact that cotton has experienced no enhancement in price commensurate with the rise in other commodities?

Is it a fact that cotton is in no way a war material? That copper is used for making cartridge cases, but that cotton is not used in making the explosives that go in those cases?

Has the Federal Trade Commission been instructed to look into the cost of producing cotton?

Has Mr. Daniels talked to the cotton planters about cost plus a reasonable profit?

Is it true that it makes a great difference whether one hundred million pounds of a commodity is produced by 20,000 stockholders or 20,000 planters?

Is there not a lot of piffle in politics?

BY THE WAY

In *The Anode*, the organ of the Bureau of Safety of the Anaconda Copper Mining Co., is chronicled an accident that seems unusual. A miner accidentally got some carbide inside his underwear and received a bad burn when he took a bath without undressing. To remove the danger of a repetition of such a calamity, we suggest that *The Anode* consider the possibility of arranging for the separate washing of underwear and bodies.

The tremendous mine explosions which opened the British attack on Wytschaete Bend, June 7, were heard by David Lloyd George, the British Premier, who was staying for the night at his residence, Walton Heath, according to the New York *Times*. The plans for the attack had been long maturing, and when the preparations were perfected, the Premier was acquainted with the exact hour that it was intended to open it. Accordingly, on retiring Lloyd George gave orders to be called at 3 o'clock in the morning, on the chance of being able to hear the explosions. The Premier and other members of the household clearly heard the tremendous detonations, as also did persons in the Premier's official residence in London, who supposed that they were the sounds of heavy guns until they learned later from dispatches that they came from the explosions of mines. From London to the region where the British mines were exploded along the German front the distance is 130 to 140 miles.

In an article entitled "The Most Wonderful Man I Ever Knew," in the *American Magazine* for July, John Hays Hammond gives the following interesting anecdote about the inception of deep-level mining on the Rand by Cecil Rhodes:

A revelation of the methods by which Mr. Rhodes's mind operated is shown in his championship of deep-level mining—his starting project to risk millions of dollars in sinking shafts several thousand feet into the earth on the chance of finding gold there. All mining on the Rand hitherto had been of the "outcrop" species. To sink unprecedently deep shafts with the idea of intersecting a gold reef in the bowels of the earth was a most daring proposal. This is the story of the start of his undertaking:

Mr. Rhodes, Dr. Jameson and I, together with some of my engineers, were camping out one night in a wild part of Rhodesia, where the lions were roaring around us and had to be constantly frightened away by a wall of fire and the firing of guns. It was not uncommon in these regions for lions to dart in and snatch our donkeys or even to carry off a negro boy occasionally.

As we sat about the fire, Rhodes began to discuss the future. He wanted to know how long the Rand reef would last. I told him that geologically there was no reason why it should not last many more years—that there was no reasonable limit, from an engineering point of view, to the depth mining could be carried. Then I went on to explain that, whereas outcrop claims were selling anywhere from $10,000 to $100,000 per acre, we could pick up all the other land for deep-level mining at $50 or $100 per acre, provided no one discovered what we were trying to do. I figured out that, allowing for the cost of sinking shafts to a depth of 3000 ft., his profits would be 20 or 30 times as great as those yielded by the enormously costly outcrop lands.

"Why would it not be good business to sell the outcrop company holdings," Rhodes asked, "and quietly buy all the ground along the deep levels for 10 or 12 miles, and start mining at 2000 to 5000 ft.?"

"I recommended that to Barnato," I said, "but he was too busy with other things to bother about it."

"Let's send a cablegram to London at once!" Rhodes exclaimed.

About 2 o'clock in the morning my secretary—now Lord Saye and Sele, a fearless adventurer, a D. S. O. man and a crack shot—started, with only a couple of natives, on a 500-mile ride across dangerous country to the nearest railroad station at Mafeking, with a cable to the London directors of the Consolidated Gold Fields. The cable was briefly this: "Have decided best policy for company should be sell out our entire holdings in outcropping companies. Do this at once. Cable reply."

It took over a month for our representative to cover the land journey, receive the reply and rejoin us near the Zambesi, a total ride of over 1000 miles. And this was the wording of the directors' reply: "We don't understand your cablegram. Do you wish us to liquidate company? This cannot be done without full explanation to directors."

Rhodes was furious. He was not in the habit of having his explicit instruction fail to be carried out. He sent back this cablegram: "Do exactly what I instructed you to do at once without asking questions. I take full responsibility. C. J. R."

This time the London agents obeyed. When we got back to Johannesburg, several million dollars' worth of shares had been turned into cash at very high prices, the market being then in the thick of a boom. We immediately set machinery in motion to acquire all the land we wanted, and though there was infinite haggling by some of the parties in interest, we finally got nearly all we were after, and the whole deep-level plan of mining was mapped out and started. We had to spend millions before we reached a trace of gold, and more millions before we won a single ounce of metal. But within two years we had made $10,000,000 profit on the transaction. Had it not been for deep-level mining, the Rand would have been nearly exhausted by now.

Personals

A. H. Rogers has returned from California.

Robert Sticht is now at Pasadena, Calif. We expect that he will visit the East ere long.

George D. Van Arsdale has returned to New York from a protracted visit to the Arizona copper camps.

E. B. Hopkins, geologist, has gone to Mexico for the Associated Geological Engineers.

Robert Hadfield, chairman and managing director of Hadfields, Ltd., Sheffield, England, has had a baronetcy conferred upon him.

Henry M. Adkinson has returned to Salt Lake City from New York, where he has been engaged in professional work since April.

H. J. Stehli, captain in the First Engineer Regiment, has been assigned to Colonel McKinstry's staff, and is now at Fort Totten.

Stuart Rawlings arrived in Peru last month to take the position of assistant general manager of the Cerro de Pasco Mining Company.

A. O. Gates, Salt Lake sales engineer for the Dodge Sales and Engineering Co., has been ordered to active duty as lieutenant in the United States Naval Reserve.

C. Edwin Clarke, formerly master mechanic of the Cambria Steel Co., Johnstown, Penn., is now chief engineer of the Wilmington Steel Co., Wilmington, Delaware.

J. C. Dick and **C. T. Van Winkle** announce that they have opened offices for the practice of mining and metallurgical engineering at 505-6 Scott Building, Salt Lake City, Utah.

Clifford B. Langstroth, supervisor of the heat-treating and drop-forge departments of the Ross Rifle Co., Quebec., has been appointed metallurgist with the Link-Belt Co., Indianapolis.

R. A. Bull, for the past year connected with the Chicago Steel Foundry Co., has been elected vice president and general manager of the Duquesne Steel Foundry Co., Coraopolis, Penn.

George E. Burton, assistant director of the Oklahoma Geological Survey, is using his month's vacation for consulting work in petroleum geology, mining and mine geology, outside the State of Oklahoma.

Carl R. Davis, general manager of Brak pan Mines, Ltd., Brakpan, Transvaal, will spend the months of August, September and October in the United States. He will probably be in New York in September.

E. L. Larison has resigned as superintendent of the Anaconda Copper Mining Co.'s acid department at Anaconda to take a similar position with the Garfield Chemical and Manufacturing Corporation at Garfield, Utah.

Herbert W. Gepp, who has many friends in this country, has been appointed general manager of the Electrolytic Zinc Co., of Australia, Prop., David Meredith succeeding him as general manager of the Amalgamated Zinc Co.

M. M. Duncan, vice president and general manager of the Cleveland-Cliffs Iron Co., has been reappointed a member of the board of control of the Michigan College of Mines by Governor Sleeper. Mr. Duncan has served on the board for several terms.

J. D. Collier, director of L. J. Healing & Co., Ltd., Tokyo, Japan, engineers and contractors, is visiting America on a short business trip and expects to arrive in New York the first week in August. His address is c/o W. J. Sparks, Inc., 17 Battery Place, New York.

Orrin M. Sackett, for 25 years tramway superintendent for the Smuggler Union Mining Co., Telluride, Colo., has resigned to take charge of tramway construction at the Sunnyside mine, Silverton, Colo., for the United States Smelting, Refining and Mining Company.

John G. Kirchen, general manager of the Tonopah Extension Mining Co. and allied interests, will remove to Reno, Nev. He will retain his position with the company. Alliene Case, until recently with the West Tonopah company, will become general superintendent under Mr. Kirchen.

Dr. A. R. McCallum, of Ottawa, Dr. D. F. Adams and Dr. R. F. Ruttan, both of McGill University, Montreal, members of the Canadian Advisory Council on Scientific and Industrial Research, are visiting the principal cities of western Canada and conferring with the local technical committees, appointed to coöperate with the Advisory Council.

Charles J. Barr, who resigned last year as general superintendent of the Ensley Works of the Tennessee Coal, Iron and Railroad Co. to become general manager of the Algoma Steel Co., Sault Ste. Marie, Ont., will return to the service of the Tennessee company. It is expected that Mr. Barr will have charge of the extensive construction program which, as recently announced, the Steel Corporation will carry out at Fairfield, Alabama.

John D. Ryan, president of the Anaconda Copper Mining Co., has joined the group of prominent industrial executives volunteering to serve the Red Cross during the war without compensation, and has been assigned as director general of military relief. He will be in charge of all of the relief work for the fighting forces, succeeding Col. Jefferson R. Kean, who has been ordered to take command of the 160 United States army ambulance sections in the war theater. Mr. Ryan will devote virtually all of his time to the vast problem of maintaining base hospitals abroad and at the home cantonments and camps, and of keeping at its maximum the personnel and material reserves that back up this service.

Obituary

Charles A. Williams, said to be a mining engineer from South Africa, was lost overboard recently, while en route from England to the United States.

Edward W. Ansted died at Connersville, Ind., June 19, aged 65 years. He had been engaged in manufacturing for many years, and for over 25 years had been president of the Connersville Blower Co. and several other industrial companies.

William C. Scofield died in Cleveland, Ohio, July 6, aged 95 years. After working in that city for a number of years, he acquired control of the old Otis Iron Co., afterward sold to the Republic Iron and Steel Co. Later, he organized the Lake Erie Iron Co., of which he was president for many years.

Charles W. Drysdale, of the Canadian Geological Survey, who was in charge of a Survey party working in British Columbia, was drowned on July 11. In company with his assistant, William J. Gray, of Vancouver, an aviation student, he attempted to cross the Kootenay River near Cross River, on a raft, when they were thrown into the water by the raft upsetting and carried off by the current. The bodies had not been recovered at last account. Mr. Drysdale, who was about 32 years of age, left a wife and three children.

Casimir von Philp died at Ocean City, N. J., July 5, aged 64 years. He was born in Sweden and came to this country when a young man. He was an engineer of unusual ability and originality. For a long time he was chief engineer of the Bethlehem Steel Co. and in recent years was in charge of the machinery department. His inventions included improvements in rolling mills and special features of heavy forging equipment produced at the Bethlehem works. He was a member of the American Society of Mechanical Engineers and of the Engineers' Club, New York.

Edouard Maneuvrier, assistant director general of the Société des Mines et Fonderies de Zinc de la Vieilla-Montagne, died on Apr. 16, at Guéthary, France. M. Maneuvrier was a distinguished figure in the mining and metallurgical industry of France and Belgium. A graduate of the Ecole Normale, he early became connected with the Vieille-Montagne, and most of his active career was passed in the high administration of its affairs. He was president of the French Chamber of Metal Mines, a member of the Comité des Houilleres, president of the Société des Houilleres d'Epinac and a member of the Council of the Société Le Nickel.

Frank Firmstone died at Glendon, Penn., June 27, aged 71 years. For many years he was one of the prominent figures among blast-furnace operators in the East. He graduated in 1865 from the Polytechnic College of Pennsylvania as a mining engineer. For 21 years he was connected with the Glendon Iron Co., at the death of his father in 1875 becoming general manager. He gave up the business in 1887 and later became associated with the Cranberry Iron and Coal Co., Cranberry, N. C., being president of that company for a number of years and a director in its subsidiary companies until his death. He was a director of the Longdale Iron Co., Longdale, Va., from its organization in 1870 until its dissolution in 1911 and in that period had intimate contact with blast-furnace operations in Virginia. In the eighties and nineties he was an active participant in the meetings and discussions of the American Institute of Mining Engineers. He was a member, also, among other organizations, of the American Society for Testing Materials, the American Society of Civil Engineers, the American Society of Mechanical Engineers and the Engineers' Club of New York.

Societies

Mining and Metallurgical Society, New York Section, will hold its meeting on Wednesday, July 25, instead of July 18, as previously announced. It will take place at the Engineers' Club, 32 W. 40th St., at 8 p.m., preceded by an informal dinner at 6:30 p.m. The change is made in order to bring the section meeting, which is important, on the same date as that of the meeting of the national society.

Arizona State Bureau of Mines will give an intensive course in first aid on Aug. 6, 7 and 8 at the University of Arizona at Tucson. It is open to all men over 18 years of age, and there are no requirements except the ability to understand English. The course is free, and special rates will probably be made at Tucson hotels and rooming houses for those wishing to take it. The work will be under the direction of S. C. Dickinson, safety engineer of the bureau. Further particulars can be obtained from Charles F. Willis, director of the Bureau of Mines at Tucson.

New Patents

Filter-Press. Charles Marshall Saeger, Jr., Palmerton, Penn. (U. S. No. 1,232,611; July 10, 1917.)

Filtration—Art of Filtration. William M. Jewell, Chicago, Ill., assignor to Jewell Engineering Company, Chicago, Ill. (U. S. No 1,232,805; July 10, 1917.)

Flotation—Method of and Means for Recovering Metalliferous Minerals by Flotation. George Crerar, Spokane, Wash., assignor of sixty one-hundredths to James L. Boyle, Los Angeles, Calif. (U. S. No. 1,232,772; July 10, 1917.)

Lamp—Miner's Carbide-Lamp. Ronchi Lazare, Portage, Penn. (U. S. No. 1,232,572; July 10, 1917.)

Ore-Concentrating Table. Enos A. Wall, Salt Lake City, Utah. (U. S. No. 1,233,149; July 10, 1917.)

Ore-Grinding Mill. Peter A. MacEachern and Nolen O'Daniel, Douglas, Ariz. (U. S. No. 1,233,086; July 10, 1917.)

Rock Drill. Michael Smith, Bisbee, Ariz. (U. S. No. 1,232,111; July 3, 1917.)

Slimes Treatment—Dewatering, Replacing and Thickening Apparatus and Process. George Moore, Joplin, Mo. (U. S. Nos. 1,231,409; 1,231,410; 1,231,411; June 26, 1917.)

Smelting — Improvements Relating to Drying or Roasting Apparatus of the Rotary Chamber Type. Oswald Elsworth, Newcastle-on-Tyne, England. (Brit. No. 104,939.)

Steel—Metallurgical Process for Converting Steel Scrap into Cast Iron. Joseph E. Johnson, Jr., New York, N. Y. (U. S. No. 1,231,259; June 26, 1917.)

Steel Ingots—Improvements in Casting Steel Ingots. W. G. Armstrong Whitworth, Ltd., Newcastle-on-Tyne, England. (Brit. No. 105,617.)

Tilting Furnaces—Improvements in and Relating to Tilting Furnaces. Samuel William Price, London, W. C., England. (Brit. No. 105,381.)

Timbering—Improvements in Miner's Timber Measuring Rods or Gages. Daniel Sandbrook Nicholas, Cardiff, England. (Brit. No. 105,129.)

Zinc—Apparatus for Producing Zinc and Other Similar Metals. Heinrich Specketer, Griesheim-on-the-Main, Germany. (U. S. No. 1,231,084; June 26, 1917.)

Zinc—Process for the Electrolytic Disposition of Zinc on Metallic Surfaces. Pascal Marino, London, W. C., England. (Brit. No. 105,255.)

Editorial Correspondence

SAN FRANCISCO—July 14

Fifty Years Freedom from labor strikes on the Comstock Lode is unique in the history of mine labor in the United States and probably in the whole of North America. The miners on the Comstock celebrated on July 3 and 4 the 50th anniversary of the organization of the Virginia City Miners Union. The celebration was participated in by the Gold Hill Union and the Silver City Union. The history of these unions is that the Gold Hill miners organized in December, 1866, and the Virginia City organization was formed on July 3 and 4, 1867. Prior to the formation of the unions there had been some demands made by the miners for a minimum wage and certain conditions favorable to the miners. In some of the mines the demands were quickly recognized. In others the men were met by a spirit of complete disregard for their rights either to fair compensation or fair treatment. Ultimately the men won their demand for $4 a day minimum wage underground and 8-hour shifts. Then the organizations of the unions were effected and a satisfactory relation established between the miners and the operators and that relation has never been disturbed nor threatened in the 50 years that have followed. When an outsider goes to the Comstock to work he is asked to join the union; if he refuses he is reported to the superintendent who advises him to comply with the request of the men. If he still refuses to become a member of the union his services are dispensed with instantly. The result of this relation between the unions and mine operators is that the union labor agitator finds no opportunity for the exercise of his gifts of disturbing industry and creating riots. A further result is that the unions have had the time and disposition to protect their members against possible injustice on the part of superintendents and bosses and in turn to protect the superintendents and bosses against possible unfairness on the part of miners. In addition to the establishment of these ideal relations and maintaining them for 50 years the Virginia City union has paid in benefits to men injured in mines and men who are ill or otherwise in need of assistance, a total sum of $400,000 or an average of $8000 a year; and not a dollar expended in labor strikes. While the situation and relation of the miners to the mine owners and operators are unique and happly the conditions underground are by no means ideal. The lower levels are hot, requiring great physical exertion and resulting in much physical exhaustion. At the same time underground miners in the extremely hot levels are incapable of accomplishing as much labor per shift as could be done under more favorable conditions. But there is no complaint on the part of the superintendents. Whatever complaint may result from any condition is easily and promptly settled by the union and the superintendent. It is probable that the organizations of the Comstock miners were the initial labor unions in the United States. At any rate it is not probable any other labor union in the United States can boast of 50 years peaceable relation with employers and expenditure of $400,000 in support and protection of members without paying strike dues. The Silver City union was of later organization as was the Mechanics Union. But both of these organizations have established and maintained the same ideal and unique relations with their employers and maintained also a high wage scale. Further, it is probable that the celebration on the Fourth of July on the Comstock is the only one in the country that was participated in by state, county and fraternal organizations and patriotic demonstrations by the schools. The governor and the lieutenant-governor and their wives were in line; the two ladies occupying positions in the drum corps of the Custer Relief Corps of Carson. The school girls of Virginia City carried the flags of the United States Army and their allies and were guarded by Boy Scouts.

BUTTE—July 16

Strike Situation in Butte has resulted in power company granting all demands of the electricians and other trades giving assurance their grievances will be considered if they return to work. Situation with the miners is serious as majority refuse to return and thousands are leaving the district. Production is almost nil, and even if things are settled soon it will be many months before anything like normal conditions will return.

Annual Reports of the different mining companies of the Butte district have been turned in to the county assessor of Silver Bow County showing the net proceeds of the mines of the district for year ended July 1, 1917. According to these reports the net earnings of all the mines of the county for the past year amounted to $44,282,500 compared with earnings the year previous of $27,656,126 and the year before that of $9,932,880. The gain of $16,626,374 was due entirely to the splendid showing of the Anaconda Copper Mining Co. The latter showed a gain in net earning for the year just ended over the year previous of $21,646,661 or $5,000,000 more than the net gain for entire county. The big loss was that of the Butte and Superior company which on account of the great increase in cost of materials, supplies and labor showed a net gain that was less than the net gain of the year previous by $6,555,324. The smaller companies all showed substantial gains over the year before, but the aggregate gains of all of them amounted to comparatively little by the side of the earnings of the Anaconda company. The latter company had a gain of more than 150% over the year previous. This of course was due to the uniformly high price of copper that prevailed during the year and the large production. During the year a number of companies in the district had a net profit for the first time in their history. This was true of the Butte Copper and Zinc Co. and of some of the very small companies. The Elm Orlu, the East Butte and the North Butte companies all showed a satisfactory increase in net earnings. The Elm Orlu company increased its earnings over those of the year previous by $371,576 or a gain of nearly 80%. The East Butte Mining Co. showed a gain of $187,144 or an increase of about 20% in its earnings. The North Butte Mining Co. showed a gain in the net profits for the year of $821,533 or an increase of between 65 and 70% in the profits over the year before.

DENVER—July 14

Tie-up of Leadville mines arranged to have taken place today was postponed for 7 days, it was announced after a meeting of miners which lasted until 2 o'clock this morning. The Leadville strike situation has been a leading topic in the state for the past two weeks. From day to day, action has been taken to defer the actual walkout of the miners and smeltermen and, at this writing, hopes are entertained that the calamity will be indefinitely postponed. At first, there were rumors that the I. W. W. was involved in this affair but it is now generally agreed that this corrupt organization has not invaded the district. Gov. Gunter, July 7, issued a proclamation appealing to "the patience and patriotism of all those employed in and about the metal mines of the state" and urgently requested "that they continue in their present employment and use every effort to increase production until Congress and the legislature of this state can carry out their plans for controlling the cost of living." The governor has called an extra session of the legislature which should be organized in shape to undertake regular functions within two weeks. Despite his request, however, the executive committee of the Leadville Miners' Union decided the strike become effective Saturday, July 14. It is estimated that the strike will affect 2300 union and non-union men in and around the mines and will seriously jeopardize the future of the district. The situation has become so critical that both state and national aid has been sought to bring about a settlement. Trouble between the union and the operators at Leadville has been existing since May, 1916, when a voluntary increase in wages of 10% forestalled a demand on the part of the miners which probably would have resulted in a situation similar to the one now confronting them. In December, the operators again made a voluntary increase in wages, bringing the scale of pay up to $3.50 per day, the present basis. Early in the present year, the union renewed its appeal to the Industrial Commission, asking for a hearing and amending its demands originally made for an increase of 75c. on the old $3.00 basis to $1.00 on the new $3.50 basis or a demand for $4.50 a day. The Commission heard the demands of the union and the evidence of both employers and employees in Leadville late in May. They decided that the union demands were not justified and refused to recommend an increase in pay.

SALT LAKE CITY—July 11

Itinerary of Mine-Rescue Car No. 1 from July 1 to Oct. 13, 1917, will be as follows: July 1-10, Salt Lake City; July 11-25, Park City; July 26-Aug. 11, Bingham; Aug. 12-18, Milford; Aug. 19-Sept. 1, Eureka; Sept. 2-15, Sandy; Sept. 16-22, Scofield; Sept. 23-29, Castlegate; Sept. 30-Oct. 6, Hiawatha; Oct. 7-13, Sunnyside. The first six are metal-mining camps, the remainder coal. In case of mine disaster the car can be reached indirectly through University of Nevada (headquarters); A. J. Stinson, Nevada state mine inspector, Carson City, Nev.; Henry M. Rives, secretary Nevada Mine Operators Association, Reno, Nev.; P. A. Thatcher, Utah Industrial Accident Commission, State Capitol, Salt Lake City, Utah; A. C. Mackenzie, secretary, Utah Chapter, American Mining Congress, and representative of the Coal and Metal Producers Association of Utah, Boston Building, Salt Lake City, Utah; H. M. Wolfiin, California Industrial Accident Commission, Underwood Building, San Francisco, Calif. and Robert I. Kerr, secretary, California Metal Producers Association, Merchants National Bank Building, San Francisco, Calif.

WALLACE, IDAHO—July 11

I. W. W. Menace is still a matter of considerable anxiety throughout the Cœur d'Alene district. The success of the outlaw organization in tying up the lumber industry in adjoining counties to the West and the serious trouble it has stirred up at Butte to the East, the presence of one or two advance emissaries of the organization, the coming of many new men of unknown affiliation attracted by the resumption of work at the Tamarack & Custer, and the distribution of anarchistic bills in certain sections of the district, have caused mining companies and citizens generally to adopt measures to cope with the situation in the event drastic action is deemed necessary. The favorable reports of an early settlement of the trouble in Butte, however, and the assurance of the war department that troops will be sent to protect the lumbermen of north Idaho and the farmers of eastern Washington, have had a most reassuring effect, and it is not believed now that the I. W. W. will be able to enlist sufficient following to make serious trouble. It is not believed that there are many actual members of the I. W. W. in the mines here, or those who are in sympathy with its lawless purposes. The success of an attempt to close the mines by a strike would depend upon intimidation and violence, just as has been the case in all other places where the I. W. W. has achieved temporary success. For this reason the improved situation at Butte and the prospect of military protection are having a strong influence in counteracting the work of the I. W. W. While it is not an agreeable subject to the management of some of the mining companies, it is a fact nevertheless that the company boarding house and store create and keep alive a feeling of resentment among employees which renders them responsive to the specious propaganda of the I. W. W. A man with a grievance is often easily induced to become identified with a cause he knows is wrong and which he would spurn, acting upon the assumption that he is justified in that course as a means of retaliation, and thus committing a greater wrong than the one to which he is subjected. The feeling toward the company boarding house was considerably intensified a few months ago when an advance of 25c. per day in wages was immediately followed by an equal advance in the rate of board. Outside of this feature, which has nothing to do with causing trouble at this time, there is nothing to justify an attempt to cause a strike.

Bunker Hill & Sullivan Co.'s first of three furnaces was blown in at Kellogg, Ida., on July 5. The first molten metal to come from the furnace was cast into small ingots bearing the initials "B. H. S." as souvenirs of the occasion and distributed among the spectators. The first one was taken by Stanley A. Easton, manager of the Bunker Hill & Sullivan company, and the second by Jules Labarthe, of San Francisco, designer of the plant. It is expected that a formal celebration on an elaborate scale will be held in August in commemoration of the completion of the smeltery, after the plant has settled down to steady operation.

JOPLIN, MO.—July 14

Sheet Ground Mines of this district will have to close down in near future unless price of ore goes up or price of supplies come down. At operators' meeting at Webb City, Thursday, some prominent operators declared land owners should cancel all royalty charges for present in the hope that by this relief mine owners would be willing to continue to lose money for a while and not close down and move mills to richer ground. A number of larger mills already have been moved to Oklahoma field, and others will be moved. The Ramage and Curtis, Cosden and Aitken interests, which are among largest in district, are planning doing this. The Ramage No. 6 mill, best in the Joplin camp, will be moved within next two months, cleanup at mine now under way. Charles T. Orr of Webb City and W. B. Shackelford of Carthage, left today for Washington to confer with Edgar Palmer, head of the government zinc committee. Mr. Orr is member of committee, but it is understood is not going in this capacity on this trip. It is presumed conference will have to do with problem of keeping sheet ground mines open in order that full zinc output may be had for government. It is believed that where mills are moved from sheet ground at present it will be long before they are replaced, on account of heavy increase in building costs. An added trouble just now is the difficulty in getting machinery supplies. The vice president of a manufacturing company from St. Louis was in Joplin during the week and advised operators that there is no reason to hope for betterment along this line in the near future. He said some makers of tubular goods have their production sold for as much as 18 months ahead. While the local demand for second-hand machinery is not quite as heavy as it was, it is still much above normal on account of the continued development in the Oklahoma and Waco-Lawton fields.

WASHINGTON—July 9

Cyanide Situation shows improvement due to increases of capacity and betterments in processes. Information being gathered by the Government indicates that an adequate supply of cyanide will be available in the near future. The manufacturers have increased their capacity decidedly and a number of new concerns are getting into the field. Unless there should be a radical improvement in the manufacturing process, which is rumored as a possibility, there **will be no** material changes in prices. There will be an evening up, it is anticipated, in which the large users of cyanide will be compelled to pay a higher rate, but the price to the small consumer is expected to decrease considerably. With all raw materials higher and with the cost of equipment and labor at a much higher level, there is no probability of pre-war prices being even approximated.

CALUMET, MICH.—July 14

Trouble with I. W. W. Agitators and their following is now seriously feared in the Michigan copper country and residents of the district, principally the men working in the mines, mills and smelteries, are taking measures to protect themselves, their homes and the industries here. During the strike of 1913, when the Western Federation of Miners tied up this camp for 8 months, a Citizens' Alliance was organized for home protection because of murders laid at the doors of imported agitators. This organization is now being revived to get action before the suspected I. W. W. forces become too menacing. During the past week activities of the agitators, who have their headquarters in Kansankoti hall, socialist headquarters in Hancock, have become alarming. A great quantity of socialist and strike literature has been brought into the district lately and is secreted in the hall, detectives claim, and efforts to flood the district with it have been made but were stopped through prompt action of informal vigilance committees. The civilian or Home Guard troop of cavalry at Calumet has twice patrolled the district, once during the day and once at night, to prevent holding of I. W. W. meetings and circulation of the literature. Despite these efforts, however, the organizers have for some time been making a house to house canvass in parts of the district in the interests of the I. W. W. The shortage of labor in the mines has helped the agitators in their work to a considerable extent, many of the men employed elsewhere and brought here by the companies found to be active members of the I. W. W. There are about twenty thousand men employed in the mining industry of Houghton, Keweenaw and Ontonagon counties. As fast as I. W. W. members are "spotted" among the mine crews they are discharged but few, it is declared, have left the district.

TORONTO—July 14

A Deposit of Graphite has been discovered in the neighborhood of St. Remi d'Amherst, Que. It is stated to be similar in grade to Ceylon graphite, regarded as the best quality, and tests of samples submitted to analysis are reported to show a high percentage of graphite. Hitherto the known deposits in Canada have been mainly in the Laurentians and usually of too flaky a character to be commercially available. The present find is considered by engineers sufficiently rich and extensive to warrant development on a considerable scale.

The Mining News

ALASKA

SHIPMENTS OF COPPER ORE, matte, etc., to United States amounted to 12,529 tons containing 7,714,928 lb. copper.

KENNECOTT COPPER PRODUCTION for June, 5,848,000 lb. comparing with 7,208,000 lb. in May and 10,500,000 lb. in June, 1916.

ARIZONA

Chochise County

STRIKE SITUATION in Bisbee has improved. Citizens refuse to permit return of agitators and say they want no more industrial disturbance during period of the war. More than 1000 I. W. W. agitators were deported.

CALUMET & ARIZONA (Bisbee)—Production of fine copper for June was 4,928,000 lb., comparing with 5,688,000 lb. in May.

SHATTUCK ARIZONA (Bisbee)—June production of copper 956,396 lb.; lead, 190,393 lb.; silver, 11,213 oz.; gold, 146 oz. June, 1916, copper production, 1,466,080 lb.; lead, 61,889 lb.; silver, 24,536 oz.; gold, 367 oz. Production six months ended June 30, copper, 8,160,889 lb.; lead, 1,652,392 lb.; silver, 109,356 oz.; gold, 1094 oz. Decrease in June, 1917, due to unsettled labor conditions.

Mohave County

MIDDLE GOLCONDA (Kingman)—Silver ore struck on upper level, 500 ft. distant from point where silver vein was struck by lower level. Body of silver ore on upper level is larger but not as rich. Property worked heretofore principally for zinc. C. N. Bell, general manager.

Pinal County

LABOR SITUATION in Ray-Hayden district shows improvement; no disturbances reported. A troop of cavalry dismounted, was expected to reach Ray as a precautionary measure in response to Gov. Campbell's request that troops be sent to every mining camp in the state.

Yavapai County

LABOR SITUATION in Jerome is much improved. Citizens assisted by score of union miners drove I. W. W.'s out of town in box cars over narrow-gage railroad. Do not expect them to return and they have been told it will go hard with them if they do.

JEROME VERDE (Jerome)—Compressor has been burned out and therefore unable to use full force of men.

COPPER LODE (Cherry)—Lane Mill, near Cherry, overhauled to treat ores from Copper Lode mine.

ARIZONA-BINGHAMTON (Stoddard)—New ball mill installed. With other additions, capacity is nearly doubled.

UNITED VERDE (Jerome)—Full force of men at mine and smeltery. Efforts will be made to get July production up to 8,000,000 lb. of copper.

ARIZONA MOLYBDENUM (Wickenburg)—New 50-ton mill in Blue Tanks district, nine miles northwest of Wickenburg, is in operation. L. E. Huber, in charge.

ARIZONA CENTRAL MINING AND PROSPECTING (Skull Valley)—Optioned Bryant and Finch groups of 11 claims in Copper Basin district. Molybdenite found in neighboring Copper Hill group by A. L. Garford.

Yuma County

BEACH REEF COPPER CO. (Wendon)—Began work July, 1916. Straightened 80-ft. inclined shaft; installed 26-ft. headframe, 15-hp. Fairbanks-Morse hoist, 50-hp. F. M. engine, 12 x 12 F. M. compressor, 4 circulating tanks, and one air reeceiver. Depth of shaft 310 ft., making 1 ft. per day, using two jackhamers. Drifted at 80-ft. depth; 35 ft. west, 45 ft. east; at 170 ft., 45 ft. west and 130 ft. east, vein holds width of 4 ft. in all workings. Company incorporated in Arizona for $250,000.

ARKANSAS

Chambers County

BONANZA (Buffalo)—Putting in small sludge mill over which to run tailings from regular concentrating plant.

LION HILL (Buffalo)—A 100-ton concentrating plant nearing completion. Building commissary and boarding house. Expect to be running by middle of August.

Marion County

LONNIE BOY (Rush)—Third tunnel penetrates good orebody. Two others in ore. Preparing for erection of 100-ton concentrating plant. Operators: Zimmermann and Schofield.

J. C. SHEPHERD (Rush)—Production from Shepherd group jumped from 90 tons zinc carbonate to 120.

GLASS SAND (Guin)—W. C. Ball, G. W. Ball, W. T. Gunning and J. G. Wilbur of Webb City, take lease on glass-sand deposit. Will build $20,000 plant to crush and dry.

Searcy County

DENVER MINING AND MILLING CO. (Yellville)—Foundations in for this new dry-process custom mill.

COPPER (Buffalo)—On Buffalo River, A. F. S. Cooper is installing tram from mine to mill on O'Meara property. Ore, carbonate of zinc.

BIG HURRICANE (Pindall)—Making 90 tons zinc-carbonate concentrates a week. J. C. Shepherd, operator, has installed crane to remove waste from pit.

CALIFORNIA

Amador County

FREMONT (Drytown)—Mine boarding house destroyed by fire, June 24; 40 inmates narrowly escaping death. Building and most of contents wholly destroyed. Second destruction of boarding house by fire in 9 years.

OLD EUREKA (Sutter Creek)—New electric equipment, ordered more than year, arrived and being installed. Shaft below 1600 level has been widened to 2 compartments and retimbering of old workings nearly completed.

PLYMOUTH CONSOLIDATED (Plymouth)—Main shaft is vertical for about 1600 ft. and inclined to 2600-ft. level, is to be sunk 150 ft. further this year. Developments upon lower levels are good, but discovery of orebodies by lateral exploration from old upper levels, has placed in sight sufficient tonnage as to render unnecessary rapid downward development.

Calaveras County

GOLD CLIFF (Angels Camp)—Ray Sonora killed by fall of rock in 1700-ft. level on June 29. About 75 tons of rock fell; necessary to blast to recover body.

MOKELUMNE HILL district active. Hector, Lucas, Maypole and others under development and extraction. Mokelumne Hill mine to run 2 shifts of mill. Buffalo Gravel mine installing electric pump; will sink to bedrock.

GARIBALDI (Mokelumne Hill)—Sold to W. M. Stiver and associates of San Francisco. Operations 25 years ago developed high-grade ore in 95-ft. shaft. Prospecting and development in progress.

Del Norte County

COPPER AND CHROME deposits north of Crescent City under development and operation. Gravlin chrome mine, 25 miles northeast operated by M. A. Delano of Grants Pass, Ore., is producing some platinum. Tysen chrome mine 18 miles north making large shipments of chrome. Lucky Boy copper deposit being examined with view of development. Britten & Wilson developing copper ore.

El Dorado County

CINCINNATI (Placerville)—Installing a 5, 1000-lb. stamp mill, operated by distillate-oil engine. Burr Evans, consulting engineer, reports that 10,000 tons, free-milling, friable ore, assaying about $3.50 gold, blocked out; no rock breaker or concentrator required. Ore to be mined by auger boring, picked and conveyed by gravity through 250-ft. tunnel to mill. Milling cost estimated at 54c. and cost of extraction and tramming at about 26c. per ton. Berkeley and San Francisco capital interested.

EL DORADO DEVELOPMENT CO. (Placerville)—Test run to be made on 20 tons gold quartz from Teddy Bear and Hot Spur claims in Grant Busick's 5-stamp mill. J. W. Cover, in charge.

BALD MOUNTAIN CHROME DEPOSIT produced over 250 tons high-grade ore. Deposit 23 miles northeast of Placerville. William Vaughn of Georgetown made recent shipment of 2½ tons.

Placer County

CHROME ORE shipments continue from the Iowa Hill and the Newcastle districts. Shipments from Iowa Hill are hauled to Colfax for direct rail shipment to Eastern points. Colfax is also the main line shipping point for Nevada County chrome ores, which are initially shipped over the Nevada County narrow-gage railway. Newcastle ore is hauled by motor trucks to Newcastle. Surface improvements are still in progress at the Newcastle mine; all ore running over 36% is shipped to the Eastern mills; all under 36% is crushed and concentrated for shipment.

Sierra County

ORIENTAL (Alleghany)—This former bonanza producer, on serpentine belt, to be reöpened by Croesus Gold Mining Co., owners, in conjunction with operations at the Croesus. D. F. Sheahan, of Salt Lake City, Utah, has been placed in charge of both properties, vice W. B. Pearson, resigned.

COLORADO

Boulder County

LULA B (Ward)—Being unwatered.

NATIONAL TUNGSTEN MILLING CO. (Ward)—New mill will be completed soon.

SNOWBOUND (Ward)—Shaft house and hoisting plant at Oronogo shaft being moved to property east of Gold Hill.

Clear Creek County

JACKSON MILL (Idaho Springs)—Plant sold recently to Argo Reduction & Ore Purchasing Co. Ball mill and flotation unit similar to one in operation at Argo mill will be installed. Plant will continue to run as custom mill under management of J. A. Pearce, superintendent of Argo mill.

Gilpin County

TWO FORTY MINE (Central City)—Will be unwatered at once. Milling plant will resume treating ore from Frontenac mine.

PHILADELPHIA (Apex)—Fire completely detroyed shaft house and machinery on night of July 4; timbers at shaft collar also burned, causing shaft to cave badly. Fire started by explosion of dynamite; workman capping fuses inadvertently touched one to steam pipe causing it to explode and thereby detonating some powder near-by. Man blown out of building and severely burned, but will recover. Shaft house will be rebuilt and new machinery installed.

Hinsdale County

GOLDEN FLEECE (Lake City)—Worked by Colorado-Utah Operating Co. Milling plant being remodeled and capacity increased to 100 tons daily; ball mill and flotation process will be installed. Mine development work under way.

Lake County

STRIKE SITUATION at Leadville still smoulders. Executive board of local miners' union, authorized to call strike, has not yet done so. Miners' demands are for wage of $4.50 and recognition of union. Union miners in district do not constitute over one-third of total. Mine owners declare no concessions will be made as profits do not permit higher wages. About 90 to 95% of miners returned to work after Fourth of July celebration.

San Juan County

CRATER (Animas Forks)—Active development started under direction of H. E. Kingsley.

BIG 5 (Ward)—Ball mill being installed and improvements made to increase capacity of mill.

EMPIRE STATE (Silverton)—Being developed by Fred Kunz and William Akers. Payable ore opened and a trial shipment will be made in near future.

NORTH STAR MILL (Silverton)—Operations resumed after temporary shutdown on account of railroad-bridge washout. Mill treating ore from Colorado-Detroit mine operated by S. D. & C. Co.

BEN BUTLER (Mineral Point)—Being reopened under management of Frank M. Jackson, who recently organized a company to undertake active development. Preliminary work now under way.

NEBRASKA (Silverton) — Considerable development work is being done on this property by Neal & O'Driscoll. Nebraska tunnel has been advanced 500 ft. Promising lead-silver ore opened. Work will soon be resumed in the Clara M. tunnel.

BULLION KING (Red Mountain)—Secured under lease by Baptiste Matties and associates. Active development work will be resumed. At Bullion King vein opened by about 2000 ft. of drifts, raises and winzes. Several pockets of payable ore containing silver, lead and zinc have been opened.

IOWA-TIGER (Silverton) — Tramway was recently damaged by fire, and operations will be delayed about two weeks. Terminal tower on the cliff near mine was set on fire, presumably by friction of cable against wood following an accident which caused cable to leave the rollers.

San Miguel County

CARRIBEAU MILL (Ophir)—Flotation process being installed.

BLACK BEAR (Telluride)—Daily production, 150 tons mixed sulphide ore; being treated at mill of Smuggler-Union.

JUNE CONCENTRATE SHIPMENTS from Telluride: Smuggler-Union and Black Bear, 58 cars; Tomboy, 51 cars; Liberty Bell, 12 cars; Ballard lease, 1 car; Inama & Perino Leasing Co., 2 cars; total, 124 cars.

Teller County

EXCELSIOR (Cripple Creek)—Shaft now 300 ft. deep will be sunk to 600-ft. and levels driven at 500 and 600 ft. to connect with Golden Cycle workings.

ROOSEVELT TUNNEL (Cripple Creek)—June advance, 153 ft., with one machine shift per day. Water flow about 5000 gal. per min., lowest since cutting C. K. & N. watercourse.

CRESSON (Cripple Creek)—Oreshoot opened in new vein on 14 level, drifted on for 40 ft., shows width of 4 to 5 ft. of ore, with core a few inches wide of rich ore. Working to open this shoot on 13 and 15 levels.

GOLD DOLLAR (Cripple Creek)—Shaft house, ore bins, head frame and powder magazine destroyed by fire on afternoon of July 7. All men escaped from workings. Ton of powder in magazine burned without exploding. Catherine Gold Mining Co., working property under lease, had recently installed $15,000 plant. Lightning caused fire.

IDAHO

Shoshone County

TAMARACK & CUSTER (Wallace)—Resumed operations after shut down since middle of last March. Employs from 250 to 300 men. Mill running full time, 500 tons capacity. First ore shipments to Northport, but report persists that product will be diverted to Bunker Hill smeltery on account of inability of Northport to handle it.

HYPOTHEEK (Wallace)—Management announce closed contract with diamond drill company to prospect ground for two parallel veins north and south of old vein; also ground below 1200 level to locate ore shoot. Mill of 200 tons capacity, running two shifts.

BIG CREEK (Wallace)—Located on Big Creek, six miles from Wallace, has shoot of gray copper ore in upper tunnel 18 in. wide with high silver and 8% copper. Leasers shipped 17 carloads during last two years, though not as rich as present shoot. Company has taken over ground and has carload ready for shipment. Crosscut 2500 ft. long being run to gain 560 ft. additional depth. About 600 ft. to go and expect to reach vein by Oct. 1.

HUNTER (Mullan)—Large ore shoot recently struck on level of main working tunnel in ground supposed to have been worked out. Twelve or 14 ft. of lead ore, 3 ft. of which is shipping grade. Strike adds many years to life of mine. Sinking from 1200 level to reach ore shoot located by diamond drill.

MICHIGAN

Iron

HOLMES (Ishpeming)—Shipping steadily. A few drifts are in ore. Output will be gradually increased. Both soft and hard hematites being mined.

VIRGIL (Iron River)—Diamond drilling for new ore bodies. Results to date not encouraging. If better showing is not made operations will be suspended.

ZIMMERMAN (Iron River)—Sold by Spring Valley Mining Co. to Miami Metals Co., recently organized in Chicago. Mine in operation since 1908. Non-bessemer ores mined.

OLIVER IRON MINING CO. (Ironwood)—New shaft at Aurora mine completed in April. Will start hoisting as soon as electrical machinery is installed. New Pabst shaft will be commenced when equipment arrives.

PLYMOUTH (Wakefield)—Will be heavy shipper this year. Took out over 300,000 tons last year, the first year of shipping. Over 2,000,000 cu.yd. of overburden, averaging 75 ft. in thickness, has been stripped. Will be one of the largest pit mines in Michigan. Adjoins Wakefield pit mine.

CLEVELAND-CLIFFS (Ishpeming) — New hydro-electric plant to be built on Dead River. Will develop about 10,000 hp. Company now has small plant on same river and another on Carp River. When plant is completed, company will be able to supply about 20,000 hp. to its mines and furnace at Marquette. Sufficient to allow all machinery to be electrified. Work already started on the new plant. New hospital to be erected for miners of the Ishpeming district. Oliver company will assist with upkeep.

MINNESOTA

Mesabi Range

SPRUCE-ADAMS (Eveleth)—About 800,000 cu.yd. of stripping removed to date. Contractors asking 30c. a cu.yd. Former price was about 20c.

PEARSON (Nashwauk)—Washing plant about completed. Most of machinery is on the ground. Mine is ready to supply ore when concentrator is finished.

COLERAINE—Big washing plant at Trout Lake being operated to capacity on ore from Holman and Canisteo pits. Wash ores in great demand this year by furnaces.

MAJORCA (Grand Rapids)—New pit mine on western Mesabi. Tract of 160 acres. Stripping under way. Shipments of ore to start about Aug. 1. Ore proved up by diamond drills.

OLIVER IRON MINING CO. (Virginia)—Permission granted to mining company to erect concrete trestle, to cost $100,000, on Second Ave., near Gilbert Rd. Trestle for purpose of affording traffic outlet when Mesaba Mountain mine pits are extended.

GREAT NORTHERN ORE PROPERTIES leased by M. A. Hanna Co., Cleveland, Ohio, include old Steel Corp. mines; Harold, Leonard, Mississippi, North Uno, South Uno, and Thorne; other properties

are Fay, Wabigon, Dale and Feigh. Tonnage involved between 40,000,000 and 50,000,000. New company will be Hanna Ore Mining Co., J. D. Ireland, formerly in charge of Hanna mines at Duluth, will be general manager, and E. E. Hunter of Arthur Iron Mining Co., the Hill mining organization, assistant general manager. Reported that period of lease is 10 years on royalty basis. Also three bulk freighters, one already launched and two under construction taken over. Jones & Laughlin and Inland Steel recently leased on this property and Tod Stambaugh Co., Butler Bros. and others negotiated previous leases. Hill interests said to retain only 15% original holdings.

MISSOURI

Joplin District

C. H. & M. (Duenweg)—Operating new 150-ton mill on Malloy lease, just south of town. Heavy water and peculiar formation caused loss of one of two shafts recently, but another is being sunk.

RED BIRD (Webb City)—Clean-up now under way with probability that mill will be moved to one of Curtis, Cosden and Aitken leases near Century, Okla.

McDONALD BROS. (Webb City)—Sinking second shaft at new mine on Connor land to 200 ft. First shaft only 160 ft., but drifting showed this to be above main ore run.

WACO (Joplin) — Completed shaft on lease at Waco, Mo., and begun drifting. Will start erection of mill soon. Also drilling on several other tracts; reported to have discovered rich run of sheet ground ore at 300 ft. P. B. Butler, Joplin, manager.

LUCKY ELEVEN (Carthage)—Sold to Austin Brothers and associates during past week for $30,000. A. Barlow and associates of Carthage were owners. Mine developed in recent months and planning new mill.

MIAMI ZINC SYNDICATE (Baxter, Kan.) — Purchased two gasoline-driven drills to solve problem of drill scarcity. Has seven other drills working on leases west of Baxter, and good strikes are rumored. Nothing given out by company, which presumably is subsidiary of Butte & Superior.

F. C. WALLOWER (Joplin)—Moving Number 2 Cumberland mill from location south of Carterville to 40-acre lease just west of Tar River, Okla. Will be ready for operations in fortnight. Later this year Number 2 Cumberland mill now located at Prosperity likely to be moved to same lease.

O. W. SPARKS (Galena) — Is making more than car of ore weekly with only three hand jigs from new mine on East Fifteenth St., in Joplin. Product exceptionally high grade, averaging over 64% metallic zinc for 4 cars.

JOPLIN-COLUMBUS (Joplin)—Resumed operations at mine on Phoebus land north of Galena after protracted shut-down. Operating at 130 ft. with good output. Is one of older mines of district.

MONTANA

Lewis and Clark County

HELENA MINE (Helena)—Drifting and stoping on 300 level. Silver, lead and iron. Last car load went $42.55 gross.

VALLEY FORGE (Rimini)—Thirty car loads sent to New York-Montana works in June. Eight car loads of concentrate.

LOOBY (Helena)—Drifting east, west and north at 150 level. Silver-lead ore from north drift.

PEERLESS JENNIE (Rimini)—Property under bond and lease to Chicago people. Begin work August first. Shaft 350 ft. deep Location, five miles above Rimini.

ROCK ROSE (Helena)—Shaft 250 ft. deep. In hornstone, vertical. Good ore in 100 and 200 drifts. Drifts to be run at bottom of 300-ft. shaft.

ST. LOUIS CO. (Marysville)—Twenty-five stamp mill reducing 100 tons a day of gold ore, by cyanide treatment. Electric power. Ore from Maskeline tunnel of old Drum Lummon mine.

STANTON MINE (Rimini)—Lead and zinc ore to New York-Montana Testing and Engineering Works, Helena. Mineral separated at works and concentrates sent to smeltery.

BARNES-KING (Butte)—Development work on 500-ft. level of Shannon mine reported to have struck good ore in drift for 150 ft. Width of vein not known. Ore from Shannon and Piegan-Gloster properties being treated at Lone mill near Gloster.

Silver Bow County

EAST BUTTE (Butte)—June output of copper was 1,519,230 lb.; silver, 44,621 oz.; comparing with May copper production of 2,008,060 lb. Repairs to mine and smeltery being made during present shutdown due to strike conditions.

BUTTE DETROIT (Butte) — Mill will handle 200 to 400 tons manganese ore per day before Aug. 1. Changes being made in crushers and jigs by large force of carpenters and other men during last two weeks. Machinists, electricians and blacksmiths now at work. Reported that electricians' strike, which has been on for last month, will soon be ended and then rest of work will be rushed. Mill will handle Davis-Daly and other companies' manganese ores.

NEVADA

Esmeralda County

CUPRITE SULPHUR CORPORATION (Goldfield)—Purchased sulphur property at Cuprite. Operating mine and shipping ore to Pacific Coast, and Pennsylvania. Expect to increase output to 1000 tons per week. Retorting plant to be installed. J. E. Bowman of Greenwich, Conn., president; F. S. Taggart, vice president. New York office, 50 East 42 Street.

Nye County

RED TOP (Manhattan)—Pump station being cut, and foundations in place for installation of compressor. Cross cut to east continued and 25 ft. from shaft change in dip of formation encountered; drift face shows considerable increase in richness of ore.

MANHATTAN-MORNING GLORY (Manhattan)—Operations reported during week continue to develop ore in both working shafts. No. 3 shaft from which drifts are being extended shows ore in west drift, carrying gold contents. In addition to low-grade ore in No. 1 main working shaft, new orebody is being developed near south boundary of claim.

UNION AMALGAMATED (Manhattan) —East drift encountered lime shale at 390-ft. point, and for 25 ft. ground has been timbered. Face of the drift is now in silicified shale and should not give any further trouble from caving. No. 2 crosscut west is following break to pick up ore cut in No. 2 raise. No. 6 crosscut is showing ore in face indicating proximity of ore shoot. West drift is in a low-grade quartz.

TONOPAH ORE PRODUCTION, for week ended July 7 was 6923 tons, valued at $121,151, comparing with 9283 tons for the previous week, falling off being due to holidays on July 3 and 4. Producers were: Tonopah Belmont, 1939 tons; Tonopah Mining, 1450 tons; Tonopah Extension, 1700 tons; Jim Butler, 700 tons; West End, 698 tons; Rescue, 251 tons; Midway, 132 tons.

Storey County

COMSTOCK MINES reports for week generally showed repairs in progress and advancing drifts. Third and Fourth of July work generally suspended owing to the celebration of 50th anniversary of organization of Virginia City Miners Union, owing to long continued satisfactory relations between unions and mine superintendents.

CON. VIRGINIA (Virginia)—Extracted 84 cars of ore from 2700 level; 77 cars of this ore assayed $12.08 per ton; 17 cars from winze assayed $21.21 per ton; 65 cars were sent to Mexican mill and 19 cars to C. & C. ore bins.

White Pine County

FORT SCHELLBOURNE MINING & MILLING (Schellbourne)—Operating McMahon mines which produced $200,000 in silver and gold in early 60's. Now running tunnel to intersect quartz vein in depth, which at surface and in upper workings is about 20 ft. wide and averages $1 gold and 12 oz. silver per ton. If intersection occurs, expect to develop about 2 million tons.

OREGON

Josephine County

QUEEN OF BRONZE (Takilma)—This copper mine has 80 men employed and increasing force. John Hampshire, manager.

THE BOSWELL (Holland)—This gold mine installed gas engine to be used in operating recently installed Huntington mill. Boswell and Son, managers.

WALDO (Takilma)—This copper mine leased for past few months by DeWitt Van-Ostrand of Phillips, Wis., and A. H. Gunnell of Grants Pass, Ore. Repairing concentrator and putting new track in tunnel No. 4.

UTAH

Juab County

TINTIC PRODUCTION for June was 1026 cars, and production for first six months, 5363 cars, or about 250,000 tons.

Salt Lake County

OHIO COPPER CO. (Bingham Canyon) —Company's statement says May production of copper was about 600,000 lb. due partially to flotation methods. Alfred Frank, general manager, and F. E. Turner, mine superintendent estimate blocked-out ore 520,000 tons of 1%, 100,000 tons better than 0.81%; other deposits, 5,000,000 tons better than 0.75%; 10,000,000 better than 0.75% and large part over 1%. About 3,000,000 tons tailings running 10 lb. to ton remain from past operations.

CANADA

British Columbia

GRANITE-POORMAN MINE (Nelson)—New compressor plant, capacity 1500 cu.ft. of air and 300-hp. electric motor being installed. Will give power enough to treble output. Also 4 new concentrating tables put in giving 100 tons per day concentrating capacity. Amalgamation and stamp end will be improved later. Now employing 35 men. A. G. Larson of Spokane, consulting engineer; F. H. Skeels, superintendent.

Ontario

MILLER LAKE-O'BRIEN (Gowganda) —During June shipped 105,000 lb. of high-grade ore.

ALEXO (Porquis Junction)—Nickel ore shipments during June amounted to 846,000 pounds.

CROESUS (Monroe Township)—Water seam encountered and lower levels reported to be flooded. Additional pumping equipment installed. The 50-ton mill is running at nearly full capacity.

TRETHEWEY (Cobalt)—Has taken over group known as Quesnel-Demarse claims in Cane Township, Montreal River district, comprising about 120 acres. Employing 18 men on surface work preparatory to exploration.

McINTYRE (Porcupine) — Production during June was $141,208, from treatment of 14,455 tons of ore averaging $10.24 per ton. Expect that station will be cut at 1000-ft. level in Jupiter shaft within two months. Drift at 100-ft. level of McIntyre entered Jupiter property where vein widened to 55 ft.

KIRKLAND LAKE (Kirkland Lake)—Ball mill with capacity of 150 tons per day will be installed and concrete foundations laid this autumn. Estimated that 50,000 tons of ore on dump, averaging about $12, which with ore blocked out will keep mill operating to capacity for about 11 months.

GREEN-MEEHAN (Cobalt)—Shaft dewatered to 200-ft. level; sampling being done. Several hundred tons of ore on dump will be treated at customs mill.

ADANAC (Cobalt)—A 2-in. vein of good ore reported at 310-ft. level has widened to 8 in.

NIPPISSING—During June estimated value of ore mined was $269,469; shipped bullion and residue from Nipissing and customs ore estimated at $475,320. Development and exploration work resulted in discovery of number of small veins, one of which might produce small amount of high-grade ore.

TEMISKAMING (Cobalt) — Production during first six months of year amounted to 389,317 oz. of silver. Bullion in storage, due from smelters and ore bagged at mine aggregated 320,667 oz., and cash in hand was $343,135. Report states that development work discovered nothing since new big vein was found in 1914. Little ore remains in place, and about 8400 tons is mined and ready for hoisting, including 20 tons of high grade.

Yukon Territory

YUKON GOLD (Dawson)—Strike of steam-point and hydraulic men begun in June. Did not affect dredge crews at start. About 200 out of 400 men went out.

COSTA RICA

COSTA RICA MANGANESE AND MINING CO. (Playareal)—Loaded second 1000-ton shipment of ore (54% Mn, 7% SiO_2) June 16. Expect to ship at rate of 2000 tons per month. Capacity will be increased to 5000 tons per month when pier and harbor construction work completed. Shipping to American Manganese Manufacturing Co.'s furnaces at Dunbar, Pennsylvania.

CUBA

HOLGUIN EXPLORATION CO. (Holguin)—New decantation cyanide plant put in operation May 15; a mill using amalgamation and flotation equipment will be ready soon; C. A. Randall in charge. New York office, 25 Madison Ave.

CHILE

BRADEN (Sewell)—Output of copper for June, 5,002,000 lb., comparing with 6,750,000 lb. in May and 2,258,000 in June, 1916.

SOUTH AFRICA

TRANSVAAL GOLD OUTPUT in May was 779,385 oz., an increase of 36,607 oz. over April. For the five months ended May 31 the total was 80,004,311 in 1915, and 78,828,353 in 1916; a decrease of 1,175,958. Number of negro laborers in May was; gold mines, 180,168; coal mines, 11,432; diamond mines, 5805; total, 197,405, a decrease of 6319 from April.

The Market Report

Metal Markets

SILVER AND STERLING EXCHANGE

July	Sterling Exchange	Silver New York, Cents	Silver London, Pence	July	Sterling, Exchange	Silver New York, Cents	Silver London, Pence
12	4.7563	80½	40¾	16	4.7563	81½	41½
13	4.7575	80½	41	17	4.7550	80½	40⅞
14	4.7560	79½	40½	18	4.7550	80½	40¾

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

July	Copper Electrolytic	Tin Spot.	Lead N. Y.	Lead St. L.	Zinc St. L.
	27		10¾	10¾	8¾
12	@28	62¾	@11	@10.90	@8¾
	27		10¾	10.50	8¾
13	@28	62¼	@11	@10.90	@8¾
	26½		10½	10.50	8¼
14	@27½	62¼	@11	@10.90	@8¼
	25		10¼	10¼	8¼
16	@26	62	@11	@10¼	@8¼
	24½		10¼	10¼	8¼
17	@25½	62¼	@11	@10¼	@8¼
	24		10	10¼	8
18	@25	62¼	@11	@10¼	@8¼

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

The quotations for electrolytic copper are for cakes; ingots and wirebars. Electrolytic copper is commonly sold on "regular terms" (r.t.), including freight to the buyer's works and is subject to a discount for cash. The difference between the price delivered and the New York cash equivalent is at present about 0.25c. on domestic business. The price of electrolytic cathodes is 0.05 to 0.10c. below that of electrolytic. Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 17c. per 100 lb. above St. Louis.

Some current freight rates on metals per 100 lb. are: St. Louis-New York 17c.; St. Louis-Chicago, 6.3c.; St. Louis-Pittsburgh, 13.1 cents.

LONDON

July	Copper Standard Spot	Copper Standard 3 Mos.	Copper Electrolytic	Tin Spot	Tin 3 Mos.	Lead Spot	Zinc Spot
12	130	129½	142	244	239	30½	54
13	130	129½	142	237	234¾	30½	54
14	...	...	...	...	...	...	...
16	130	129½	142	237½	234¾	30½	54
17	130	129½	142	239	236¼	30½	54
18	130	129½	142	239½	236¼	30½	54

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2,240 lb. For convenience in comparison of London prices, in pounds sterling per 2,240 lb., with American prices in cents per pound the following approximate ratios are given, reckoning exchange at 4.80. £15 = 3.21c.; £20 = 4.29c.; £30 = 6.43c.; £40 = 8.57c.; £60 = 12.85c. Variations, £1 = 0.21¼c.

NEW YORK—July 18, 1917

All of the markets exhibited decided weakness right through the week. This was due to the disinclination of buyers to take anything, their attitude being influenced over uncertainties as to the policy in Washington, and, moreover, by the fact that prices had previously become so high as to be strangling consumption. The latter factor in the present situation has probably been underestimated.

Copper, Tin, Lead and Zinc

Copper—Copper was offered down from day to day. In the latter part of the last calendar week, there were some important foreign inquiries, for which there was rather sharp competition among the producers, which resulted in the consummation of transactions of considerable magnitude. After that, there was stagnation in buying, the immediate foreign demand having been satisfied and domestic consumers not being desirous of taking anything. On the other hand, there were agencies who were strongly desirous of selling and the market was offered down sharply, with real pressure.

Copper Sheets are quoted at 39@40c. per lb. for hot rolled, and 1c. higher for cold rolled. Wire is quoted at 35c. per lb., f.o.b. mill.

Tin—The dullness continued, transactions being relatively few and of no particular moment. There was no material change in the price for Straits tin. Banka tin became relatively weaker, the quotation for that grade at the close being 59@60c., showing a discount of about 3c. per lb. from the price for Straits tin against about 2c. in the previous week.

Lead—Transactions were only moderate in volume. The A. S. & R. Co., maintained its price at 11c., New York, and sold at the price, while other interests—not so much producers as agencies and brokers—sold at lower prices. However, it is probable that certain producers would meet those prices if they could get business. The situation was just the opposite from what it was a little while ago, when outside interests were realizing prices higher than that of the A. S. & R. Co. The tone of the market was distinctly weak, there being offers that were apparently in part of lead held speculatively and in part of lead offered by manufacturers for resale through brokers. At the close, lead was offered at 10c., New York.

The weakness in lead was the more noteworthy in view of the bad situation at the mines in southeastern Missouri. The native miners in that district refuse to permit foreigners to work, and that has brought mining practically to a standstill. The smelteries are still running on reserve stocks of ore, but they will be obliged to shut down within a few days unless the situation in the mines is promptly changed for the better.

Zinc—This metal was under steady pressure right from the beginning of the week. On the decline a fair tonnage was placed, but nothing to brag about. On the 18th, a round lot was sold at 8¼c. in the morning, and immediately afterward the metal was offered at 8.15c., with 8.05c. the best bid. Toward the close, offers as low as 8c. were reported.

The situation in zinc is simple enough. At present production is in excess of the demand and the market is being sold down to check production rather than to let stocks accumulate further.

Zinc Sheets—Price of zinc sheets has not been changed. Market is still at $19 per 100 lb. f.o.b. Peru, Ill., less 8% discount.

Other Metals

Aluminum—The aluminum market continues extremely quiet. Quotations are somewhat lower, quick delivery being offered at 55@57c. per lb. for No. 1 ingots at New York; futures slightly lower.

Antimony—This market is in about the same situation as the major metals. Demand is light and on the other hand there are sellers who seem to be anxious to realize on holdings. Consequently, there was a further decline in price. We quote spot at 15@16c., and August shipments from China at 14@14½c., c.i.f., in bond.

Bismuth—Quoted at $3.50 per lb.

Cadmium—Quoted at $1.40@1.75 per lb.

Cobalt—Quoted at $1.70 per lb.

Magnesium—Ingot is quoted at $2.50.

Nickel—Steady at 50@55c. per lb., with premium of 5c. per lb. for electrolytic.

Quicksilver—The market is somewhat stronger than reported last week. The stocks in New York are light, and quotations are made here at $105@110. San Francisco reports by telegraph $100, firm.

Gold, Silver and Platinum

Gold—Coin to the amount of $2,500,000 has been withdrawn from the New York subtreasury for shipment to Spain. Telegraphic transfer of $2,638,000 to San Francisco was made by New York subtreasury, representing an equal gold export to Japan.

Silver—The silver market experienced some violent fluctuations in London the past week, selling at 41 pence on the 13th, at 40¾ on the 14th and at 41¼ on the 16th, due to special orders to buy or sell coming on a narrow market. Shipments from New York to London continue very small as the Oriental banks are diverting shipments to China and India for shipment via Frisco and the Pacific and on account of the difference in cost for freight and insurance via the Pacific are able to pay a higher price than London bids.

Total exports from San Francisco for month of June amounted to 6,812,000 oz. silver. Silver market closes steady at 40⅞ pence bid in London.

On July 16, silver sold at 41¼d. in London, the highest figure since 1892. The price rose in spite of the Indian Government's prohibition of silver imports except under license. This prohibition is expected to divert to the London market silver otherwise exported from San Francisco to India.

Mexican dollars at New York: July 11, 62¾c.; 12, 63c.; 13, 63⅜c.; 14, 63⅜c.; 16, 63¾c.; 17, 63¼c.

Platinum—Quoted at $102@105, market quiet.

Palladium—Unchanged at $110@115.

Zinc and Lead Ore Markets

Platteville, Wis., July 14—Blende, basis 60% Zn, $75 for premium ore down to $70 for medium grade. Lead ore, basis 80% lead, $120 per ton. Buyers were inactive and a number of operators were unable to get bids on zinc ore. Shipments reported for the week are 2681 tons of zinc ore, 228 tons of lead ore, and 934 tons of sulphur ore. For the year to date the figures are: 75,288 tons of zinc ore, 3526 tons of lead ore and 15,783 tons of sulphur ore. Shipped during the week to separating plants, 3479 tons of zinc ore.

Joplin, Mo., July 14—Blende per ton, high $78; basis 60% Zn, premium ore $75; medium to low, $70@65; calamine per ton, basis 40% Zn, $42@40; average selling price, all grades of zinc, $71.20 per ton.

Lead, high $125.35; basis 80% Pb, $120@115; average selling price all grades of lead, $121.05 per ton.

Shipments the week: Blende, 8809 tons; calamine, 346 tons; lead, 1031 tons. Value, all ores the week, $767,090.

Twenty-nine mills in the sheet ground area of Webb City are preparing to close down or are already out of commission. In several cases, rather than throw out of employment miners owning their homes, arrangements have been made to lease the mines to them. Several mills have been removed to Oklahoma and others are to be removed.

Midweek it seemed almost a certainty prices would be lowered on blende, but a demand for premium ore by a smelting company not usually taking this grade of ore, held it unchanged. Lead prices sagged $5 at the week end.

Other Ores

Chrome Ore—Business has been done for delivery during the remainder of the year on the following scale of prices:

30@35%— 80c. a unit, net ton, California
35@40%— 85c. a " " " "
40@44%— 90c. a " " " "
44@47%—$1.00 a " " " "

While 50% material is said to have brought in excess of $1 a unit. The market remains firm at the above figures.

Iron Ore—Prices, delivered lower Lake ports are for old-range bessemer, $5.95; old-range nonbessemer, $5.20; Mesabi bessemer, $5.70 and Mesabi nonbessemer, $5.05.

Manganese Ore—This is in steady demand and prices have risen further. Sellers are now asking $1.20 per unit for high grade metallurgical ore. Chemical ore is quoted at 5@7c. per lb., according to grade.

Magnesium Ore—Burnt magnesite in bulk is quoted at $40 per 2000 lb., f.o.b. California.

Molybdenum Ore — Small transactions, mainly of foreign ore, at $2.10@2.25 per lb. of molybdenum sulphide in concentrates assaying 90%.

Pyrites—Spanish lump quoted at 15½c. per unit on basis of 10s. ocean freight, buyer to pay war risk, excess freight and any duty. Ocean freights are 42s. 6d. from Huelva to southern ports.

Tungsten Ore—Demand is still strong and supplies short. Wolframite is quoted at $22 @23, and scheelite at $26.

Iron Trade Review

NEW YORK—July 18

Announcement of the result of the conference at Washington last week, says "Iron Age," between Government heads and the committee of steel manufacturers gave an abrupt check to business in iron and steel on any large scale. The vague ideas the trade has entertained for some weeks of possible readjustments that would have far reaching effects were sharpened into real prospects by the President's message to business calling for the same prices to the public as those fixed by the Government.

Steel producers have expected to accept special prices from the Government and to have its requirements take up an increasing share of their output; but Chairman Gary in his address to the Iron and Steel Institute late in May said that they also expected that as costs of production were advancing the Government would be willing to increase its purchasing prices accordingly.

PITTSBURGH—July 17

The iron and steel markets have come to practically a complete standstill. The cause commonly assigned is the expectation that there will be regulation of prices by the Government, directly or indirectly, which, of course, would be at much lower levels than lately obtaining. There is, however, nothing approaching definite information as to what is likely to be done, there being simply the statement of the Secretary of War last Thursday, that steel for the Government would be priced at a level insuring reasonable profits to the steel makers, with allowance for the need of the industry to expand, and the plea of the President, as to materials in general, that there should be one price to the private buyer and to the Government. This is hardly tangible enough to stop business and there is room for assuming that one cause of the market reaching its present standstill is that buyers find they cannot afford to pay present market prices. The steel market always becomes quiet when prices stop advancing, for price advances are the chief stimulus to activity. The ordinary consumer can hardly afford to pay present prices, seeing that they are about double the prices being paid on deliveries now being made, against old contracts. The market for finished wares has not been adjusted to a cost of material so much higher.

Pig Iron—Apart from some small sales of prompt iron at former prices, and rumors of cut prices on larger tonnages, wholly unconfirmed, there is nothing new, the pig iron market simply marking time. We continue to quote: Bessemer, $56@57.50; basic, $54@55; foundry and malleable, $63@56, f.o.b. valley furnaces, 95c. higher delivered Pittsburgh.

Steel—There have been no transactions of the least moment in billets or sheet bars within the past fortnight and there is no prospect of business being done. Former quotations may be repeated, but they have become practically nominal: Billets, $95@100; sheet bars, $105@110.

Ferroalloys

Ferromanganese—The market is easier, offerings being light but demand still lighter. All the statistics and computations thus far have indicated that up to date supplies have been ample, in imports of ore or alloy, provided there has been any economy at all in the consumption, and some authorities estimate that the average consumption, per ton of steel made, has been curtailed one-third. With ferromanganese selling at ten times its price before the war the strength can be attributed only to a prospective shortage and buyers are becoming dubious as to that. We quote spot at $400@450, second half at $425@450 and first half at $375 or a shade less.

Ferrosilicon—The 50% material is variable and sales have been made at prices varying from $225 to $300 per ton at furnace, depending on quality and delivery. Bessemer ferrosilicon is unchanged at $90 for 10% up to $135 for 16% material.

Spiegeleisen—Quoted at $80@85 at furnace.

STOCK QUOTATIONS

N. Y. EXCH.†	July 17
Alaska Gold M	5½
Alaska Juneau	4
Am.Sm.& Ref.,com.	103¾
Am. Sm. & Ref., pf.	112½
Am. Sm. Sec., pf., A	98½
Am. Sm. Sec., pf. B	92
Am. Zinc	23¾
Am. Zinc, pf	61¼
Anaconda	78
Batopilas Min	1
Bethlehem Steel	129
Bethlehem Steel, pf.	115
Butte & Superior	36½
Cerro de Pasco	34½
Chile Cop	20½
Chino	52½
Colo.Fuel & Iron	48½
Crucible Steel	81
Dome Mines	11
Federal M. & S.	‡20
Federal M. & S., pf.	40
Great Nor., ore ctf.	33¾
Greene Cananea	41
Gulf States Steel	117
Homestake	100½
Inspiration Con	55½
International Nickel	39½
Kennecott	42½
Lackawanna Steel	91½
Miami Copper	40
Nat'l Lead, com.	55½
National Lead, pf.	110½
Nev. Consol	21½
Ontario Min	5½
Quicksilver	1½
Quicksilver, pf.	1½
Ray Con	26½
Republic I.&S.,com.	87½
Republic I. & S., pf.	102½
Sloss-Sheffield	53
Tennessee C. & C.	17½
U. S. Steel, com	121¼
U. S. Steel, pf	118
Utah Copper	103¼
Va. Iron C. & C.	65

N. Y. CURB†	July 17
Big Ledge	2
Butte & N. Y.	1½
Butte C. & Z.	10
Caledonia	.64
Calumet & Jerome	1½
Can. Cop. Corpn	2⅞
Carlisle	4
Cashboy	.07½
Con. Ariz. Sm.	2⅞
Con. Coppermines	5½
Con. Nev.-Utah	.07
Emma Con	⅛
Ferber	‡.60
First Nat. Cop.	3½
Goldfield Con.	.52
Goldfield Merger	.06
Greenmonster	⅛
Hecla Min.	8½
Howe Sound	5½
Jerome Verde	1⅞
Kerr Lake	4½
Magma	46
Majestic	40
McKinley-Dar-Sa.	.54
Mohican	½
Mother Lode	.27
N. Y. & Hond.	12½
Nipissing Mines	7½
Ohio Cop.	1½
Ray Hercules	3½
Richmond	.56
Rochester Mines	.49
St. Joseph Lead	18½
Standard S. L.	¼
Stewart	½
Success	.30
Tonopah	6½
Tonopah Ex.	2½
Tribullion	.25
Troy Arizona	.24
United Cop.	.75
United Verde Ext.	36
United Zinc	4½
Utica Mines	.21
White Knob, pf.	1½
White Oaks	‡2
Yukon Gold	1½

SAN FRAN.*	July 17
Alta	.03
Andes	.13
Best & Belcher	.02
Bullion	.01
Caledonia	.08
Challenge Con.	.01
Confidence	.05
Con. Virginia	.34
Gould & Curry	.02
Hale & Norcross	.02
Jacket-Cr. Pt.	.08
Mexican	.12
Occidental	‡.65
Ophir	.09
Overman	.02
Savage	.07
Seg Belcher	.01
Sierra Nevada	.10
Union Con.	.18
Utah Con.	.01
Belmont	4.20
Jim Butler	.70
MacNamara	.17
Midway	.09
Mont.-Tonopah	.20
North Star	.10
Rescue Eula	.21
West End Con.	.66
Atlanta	.10
Booth	.07
Comb. Frac.	.04
D'field Daisy	.03
Florence	.18
Jumbo Extension	.31
Kewanas	.13
Nevada Hills	.20
Nevada Packard	‡.32
Round Mountain	‡.35
Silver Pick	.10
White Caps	1.30
Big Jim	‡.70
United Eastern	4.25

BOSTON EXCH.*	July 17
Adventure	2¼
Ahmeek	98
Algomah	.75
Ailloues	60
Ariz. Com., ctfs.	12¼
Arnold	.25
Bonanza	.20
Butte-Balaklava	.55
Calumet & Ariz.	76
Calumet & Hecla	533
Centennial	17
Copper Range	59½
Daly West	1
Davis-Daly	5½
East Butte	12
Franklin	‡6½
Granby	80
Hancock	14½
Hedley	16
Helvetia	‡.25
Indiana	2
Isle Royale	30
Keweenaw	2½
Lake	11½
La Salle	3
Mason Valley	6¾
Mass	12½
Mayflower	2½
Michigan	2½
Mohawk	80
New Arcadian	3½
New Idria	14
North Butte	17½
North Lake	1
Ojibway	1½
Old Dominion	55
Osceola	83½
Quincy	84½
St. Mary's M. L.	76
Santa Fe	1
Seneca Mines	10
Shannon	8⅞
Shattuck-Ariz.	23½
So. Lake	3½
So. Utah	.20
Superior	8
Superior & Bost.	4
Trinity	7¼
Tuolumne	1
U. S. Smelting	58½
U. S. Smelt'g, pf.	49½
Utah Apex	2½
Utah Con.	15
Utah Metal	4¼
Victoria	3½
Winona	3
Wolverine	44
Wyandot	.45

BOSTON CURB*	July 17
Alaska Mines Corp.	.62
Bingham Mines	12¼
Boston Ely	.40
Boston & Mont.	.60
Butte & Lon'n Dev.	.13
Calaveras	3½
Calumet-Corbin	.01¼
Chief Con.	2½
Cortez	.20
Crown Reserve	.27
Crystal Cop.	1½
Eagle & Blue Bell	2½
Houghton Copper	.75
Intermountain	1½
Iron Cap, Com.	16
Iron Cap Cop., pf.	15½
Mexican Metals	.27
Mines of America	1½
Mojave Tungsten	.68
Nat. Zinc & Lead	.65
Nevada-Douglas	1½
New Baltic	1½
New Cornelia	18
Oneco	‡.50
Pacific Mines	.30
Rex Cons	.26

SALT LAKE*	July 17
Bannack	1.00
Big Four	.24
Black Jack	.06
Cardiff	5.50
Colorado Mining	.20
Daly-Judge	8.00
Empire Copper	1.25
Gold Chain	.16
Grand Central	.68
Grand Gulch	.19
Iron Blossom	.85
Lower Mammoth	.03
May Day	.05½
Moscow	.12
Prince Con.	1.12½
Silver-King Coal'n	3.00
Silver King Con.	3.80
Sioux Con.	.10
So. Hecla	1.10
Uncle Sam	.02½
Wilbert	.15½
Yankee	.07½

TORONTO*	July 17
Bailey	‡.03
Beaver Con.	.32
Buffalo Mines	1.25
Chambers Ferland	.13
Coniagas	4.25
La Rose	.47
Peterson Lake	.11
Right of Way	.05
T. & Hudson Bay	‡38.00
Temiskaming	.33
Wettlaufer-Lor.	.05½
Dome Exten.	.18
Dome Lake	.17
Foley O'Brien	.60
Hollinger	4.50
Jupiter	‡.28
McIntyre	1.56
Newray	.54
Porcu. Crown	.48
Schumacher	.46
Vipond	.30
West Dome	.18

STOCK QUOTATIONS—Continued

COLO. SPRINGS	July 17
Cresson Con.	5.87½
Doctor Jack Pot.	.04½
Elkton Con.	.06½
El Paso	.30
Gold Sovereign	.04
Golden Cycle	2.12
Granite	.53½
Isabella	.10
Mary McKinney	.16
Portland	1.48
United Gold M.	.22
Vindicator	.75

LONDON	June 28
Alaska Mexican	£0 10s 0d
Alaska Tre'dwell	1 0 0
Burma Corp.	4 4 4½
Cam & Motor	0 8 0
Camp Bird	0 6 9
El Oro	0 10 0
Esperanza	0 9 6
Mexican Mines	4 3 9
Nechi, pfd.	0 12 6
Oroville	0 16 6
Santa Gert'dis.	0 10 6
Tomboy	0 19 6

* Bid prices. † Closing prices. ‡ Last Quotations.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York			London		
	1915	1916	1917	1915	1916	1917
January	48.855	56.775	75.630	22.731	26.960	36.682
February	48.477	56.755	77.585	22.753	26.975	37.742
March	50.241	57.935	73.861	23.708	27.597	36.410
April	50.250	64.415	73.875	23.709	30.662	36.963
May	49.915	74.269	74.745	23.570	35.477	37.940
June	49.034	65.024	76.971	23.267	31.060	39.065
July	47.519	62.940	.....	22.597	30.000	.....
August	47.163	66.083	.....	22.780	31.498	.....
September	48.680	68.515	.....	23.591	32.584	.....
October	49.385	67.855	.....	23.925	32.361	.....
November	51.714	71.604	.....	25.094	34.192	.....
December	54.971	75.765	.....	26.373	36.410	.....
Year	49.684	65.661	.....	23.675	31.315	.....

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0 925 fine

Copper	New York		London			
	Electrolytic		Standard		Electrolytic	
	1916	1917	1916	1917	1916	1917
Jan	24.008	28.673	88.083	131.921	116.167	142.895
Feb	26.440	31.750	102.667	137.895	133.167	148.100
Mar	26.310	31.481	107.714	136.750	136.000	151.000
April	27.895	27.935	124.319	133.842	137.389	147.158
May	28.625	28.788	135.457	130.000	152.522	142.000
June	26.601	29.962	112.432	130.000	137.455	142.000
July	23.865	.....	95.119	.....	125.500	.....
Aug	26.120	.....	110.283	.....	126.304	.....
Sept	26.855	.....	113.905	.....	134.071	.....
Oct	27.193	.....	122.750	.....	142.523	.....
Nov	30.625	.....	134.659	.....	155.432	.....
Dec	31.890	.....	145.316	.....	162.842	.....
Year	27.202	.....	116.059	.....	138.281	.....

Tin	New York		London	
	1916	1917	1916	1917
January	41.825	44.175	175.548	185.813
February	42.717	51.420	181.107	198.974
March	50.741	54.388	193.609	207.443
April	51.230	55.910	199.736	220.171
May	49.125	63.173	196.511	245.114
June	42.231	62.053	179.466	242.083
July	38.510	.....	168.357	.....
August	38.565	.....	169.870	.....
September	38.830	.....	171.345	.....
October	41.241	.....	179.307	.....
November	44.109	.....	186.932	.....
December	42.635	.....	183.368	.....
Av year	43.480	.....	182.096	.....

Lead	New York		St Louis		London	
	1916	1917	1916	1917	1916	1917
January	5.921	7.626	5.826	7.530	31.167	30.500
February	6.246	8.636	6.164	8.595	31.988	30.500
March	7.136	9.199	7.375	9.120	34.440	30.500
April	7.630	9.288	7.655	9.158	34.368	30.500
May	7.463	10.207	7.332	10.202	32.967	30.500
June	6.936	11.171	6.749	11 123	31.011	30.500
July	6.352	.....	6.185	.....	28.137	.....
August	6.244	.....	6.088	.....	29.734	.....
September	6.810	.....	6.699	.....	30.786	.....
October	7.000	.....	6.898	.....	30.716	.....
November	7.042	.....	6.945	.....	30.500	.....
December	7.513	.....	7.405	.....	30.500	.....
Year	6.853	.....	6.777	.....	31.359	.....

Spelter	New York		St Louis		London	
	1916	1917	1916	1917	1916	1917
Jan	16.915	9.619	16.745	9.449	89.810	48.329
Feb	18.420	10.045	18.260	9.875	97.762	47.000
Mar	16.846	10.300	16.676	10.130	95.048	47.000
April	16.695	9.459	16.525	9.289	99.056	54.632
May	14.276	9.362	14.106	9.192	94.217	54.000
June	11.752	9.371	11.582	9.201	68.591	54.000
July	8.925	.....	8.755	.....	50.750	.....
Aug	8.730	.....	8.560	.....	51.587	.....
Sept	8.990	.....	8.820	.....	52.095	.....
Oct	9.829	.....	9.659	.....	54.159	.....
Nov	11.592	.....	11.422	.....	56.023	.....
Dec	10.665	.....	10.495	.....	55.842	.....
Year	12.804	.....	12.634	.....	72.071	.....

New York and St. Louis quotations, cents per pound, London, pounds sterling per long ton. ‡ Not reported.

Pig Iron, Pitts.	Bessemer‡		Basic‡		No. 2 Foundry	
	1916	1917	1916	1917	1916	1917
January	$21.60	$35.95	$18.78	$30.95	$19.70	$30.95
February	21.16	36.37	18.93	30.95	19.51	30.95
March	21.81	37.37	19.20	33.49	19.45	35.91
April	21.65	42.23	18.95	38.90	19.45	40.06
May	21.78	46.94	19.11	42.84	19.58	43.60
June	21.95	54.22	18.95	50.05	19.34	50.14
July	21.95	.....	18.95	.....	19.20	.....
August	21.95	.....	18.95	.....	19.22	.....
September	22.88	.....	19.58	.....	19.53	.....
October	24.61	.....	21.26	.....	21.51	.....
November	30.07	.....	28.18	.....	26.55	.....
December	35.16	.....	30.95	.....	30.79	.....
Year	$23.88	.....	$20.98	.....	$21.15	.....

‡ As reported by W. P. Snyder & Co.